DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

on

Codified Regulations at 50 CFR Part 300 Subparts A and G

Implementing Conservation and Management Measures Adopted by the

Commission for the Conservation of Antarctic Marine Living Resources

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Sustainable Fisheries

June 2005

COVER SHEET

Identify Issues and Consider Regulatory Alternatives for U.S. Management of Antarctic Marine Living Resources within the Area of the Convention on the Conservation of Antarctic Marine Living Resources

Action: Consider programmatic changes to the U.S. regulatory regime at 50 CFR Part 300 Subparts A & G for management of Antarctic Marine Living Resources within the Area of the Convention on the Conservation of Antarctic Marine Living Resources

Type of Statement: Draft Programmatic Environmental Impact Statement (DPEIS)

Lead Agency: National Marine Fisheries Service (NMFS)

Cooperating Agencies: None

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Abstract: NMFS is conducting a comprehensive review of its regulatory measures to implement conservation and management measures adopted by the Commission for the Conservation of Antarctic Marine Living Resources (Commission or CCAMLR). The DPEIS describes activities related to the management, monitoring, and conduct of the fisheries; the ecological relationships between harvested, dependent and related populations of Antarctic Marine Living Resources (AMLR); the potential impacts to protected species, non-target species, and fish habitat. Further, the DPEIS considers whether to amend U.S. regulations implementing conservation and management measures adopted by CCAMLR and issued under the authority of the Antarctic Marine Living Resources Convention Act of 1984 (AMLRCA; 16 USC 2431 *et seq*.). The DPEIS focuses on four groups of actions: harvesting, trade, research, and enforcement. The status quo alternative under each of these categories is “no change.” Following publication of the Final Programmatic Environmental Impact Statement (FPEIS), a Record of Decision on preferred alternatives would form the basis for any rulemaking process to amend U.S. regulations implementing CCAMLR conservation and management measures, if appropriate.

Date by which Comments Must be Received: August 15, 2005

EXECUTIVE SUMMARY

NMFS is conducting a comprehensive review of its program of regulatory measures to implement conservation and management measures adopted by the Commission for the Conservation of Antarctic Marine Living Resources (Commission or CCAMLR). This draft programmatic environmental impact statement (DPEIS) describes activities related to the management, monitoring, and conduct of the fisheries; the ecological relationships between harvested, dependent and related populations of Antarctic Marine Living Resources (AMLR); the potential impacts to protected species, non-target species, and fish habitat. Further, the DPEIS considers whether NMFS should amend its CCAMLR implementing regulations. The DPEIS focuses on four groups of actions: harvesting, trade, research, and enforcement. The status quo alternative under each of these categories is "no action."

The alternatives for harvesting controls consider four alternatives for imposing harvest limits ranging from zero (if the United States formally objected to a CCAMLR catch limit as being too high and decided not to issue any annual permits) to issuing annual permits (by season) allowing harvest up to the level two times the largest amount of annual international harvest during the period from 1993-2003. The other two alternatives consider intermediate levels: issuing permits annually by season and within the CCAMLR catch limits (staus quo or "no action" alternative); and issuing annual permits (by season) limiting harvest to half the largest amount of annual international harvest during the period from 1993-2003. These harvest-limiting alternatives are considered by groups of "assessed" (established) fisheries and exploratory fisheries. Other alternatives to control harvest include limitations on issuing permits for future exploratory fisheries, restricting longline fishing and trawl fishing in the CCAMLR Convention Area, and modifying the scope of permits required to harvest and import toothfish.

The alternatives for trade controls consider various alternatives to strengthen the import/re-export control program for AMLR. These alternatives involve, among other things, the Catch Documentation Scheme (CDS) and the use of Dissostichus Catch Documents (DCDs). The alternatives for research controls consider revising the U.S. permit system for research within CCAMLR Ecosystem Monitoring Program (CEMP) sites, and implementing the CCAMLR scheme of international scientific observation. The alternatives for enforcement consider enhancing enforcement capability through use of Vessel Monitoring System (VMS) with additional regulations to support implementation of the VMS, and enhancing enforcement capability through participation in CCAMLR's Centralized VMS (C-VMS) program.

The United States is actively supporting CCAMLR's international scheme for managing AMLR that utilizes an ecosystem approach to management whose objective is conservation, including rational use (harvesting). Under Article II of the Convention on the Conservation of Antarctic Marine Living Resources (Convention), a guiding force in the adoption of conservation and management measures by CCAMLR, harvesting is to be conducted so as to: (a) prevent decrease in size of harvested populations below that necessary for stable recruitment; (b) maintain ecological relationships between harvested, dependent and related species; and (c) prevent or minimize risk of changes not reversible over two or three decades. Also, Article II states that conservation measures should be set ". . . taking into account the state of available knowledge of the direct and indirect impacts of harvesting, the effects of introduction of alien species, the effects of associated activities on the marine ecosystem, and the effects of environmental change, with the aim of making possible the sustained conservation of Antarctic marine living resources." CCAMLR's ecosystem approach manages the development of fisheries, takes a precautionary approach to managing risk and uncertainty, evaluates and manages direct effects (assessment of yield in relation to longer term stock status; bycatch mitigation measures; and avoidance of impacts on benthic habitats in some areas), considers the needs of predators of fished species and the recovery of depleted species, considers spatial scales of effects, and continually supports development of evaluation and assessment methods.

The existing NMFS regulations are effective in implementing conservation and management measures adopted by CCAMLR, but preferred alternatives (identified in Sec. 2.0 Alternatives and analyzed in Sec. 4.0 Environmental Consequences of Alternatives Considered) for trade and enforcement, as well as a preferred alternative for research, consider modification of existing U.S. regulations to allow for more effective implementation. This DPEIS could serve as a background analytical document for future modification of existng regulations and issuance of permits by NMFS for harvesting AMLR.

Following publication of a Final Environmental Impact Statement (FPEIS), a Record of Decision on preferred alternatives would form the basis for any rulemaking process to amend U.S. regulations implementing CCAMLR conservation and management measures, if appropriate.

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SECTION 1.0 PURPOSE AND NEED FOR ACTION

The purpose of this Draft Programmatic Environmental Impact Statement (DPEIS) is to examine the impacts to the human environment of the National Marine Fisheries Service (NMFS) regulatory program to implement conservation and management measures adopted by the Commission and approved by the United States. Through this examination, this DPEIS will also ensure that the NMFS regulatory program meets the objectives and mandates of the Antarctic Marine Living Resources Convention Act of 1984 (AMLRCA) and other applicable law.

It is also intended to use this programmatic analysis as the National Environmental Policy Act (NEPA) analysis for future permit issuance. This programmatic environmental impact statement examines a broad range of alternatives. In so doing, this programmatic analysis will serve as the NEPA analysis for future permit applications falling under catch limits included within this broad range. For example, should a catch limit be doubled by CCAMLR, NMFS would not prepare a further NEPA analysis as long as other related and assessed impacts to bycatch, marine mammals, endangered species, and habitat do not substantially change from those analyzed in the FPEIS. It is acceptable to NMFS to harvest at any harvest level analyzed in this DPEIS (specifically under each suite of alternatives under Sec. 2.1's Action I - Impose Harvest Limits; or generally under Sec. 2.1's Action II - Restrict Longline Fishing in CCAMLR Convention Area, and Action III - Restrict Trawl Fishing in CCAMLR Convention Area) and consistent with any catch limit set by CCAMLR.

This action is needed to ascertain the effectiveness of the current NMFS regulatory program to meet the objectives and mandates of AMLRCA and, where necessary, make changes to this program to improve its effectiveness in meeting these objectives and mandates. AMLRCA and its implementing regulations provide NMFS with the authority to implement CCAMLR conservation and management measures under four broad categories: harvest, trade, research, and enforcement. This DPEIS discusses the ecological (including biological) and socioeconomic impacts of issuing harvesting permits to U.S. vessels to participate in all CCAMLR fisheries throughout the CCAMLR Convention Area (Convention Area), of conducting research in Antarctica, and of issuing permits to import or re-export Antarctic Marine Living Resources (AMLR). The United States is obligated to ensure that any harvesting of, or trade in, AMLR by U.S. nationals is conducted in a manner consistent with the Convention on the Conservation of Antarctic Marine Living Resources (Convention) and AMLRCA. The DPEIS also examines the effectiveness of the enforcement of NMFS' regulatory program to meet its obligations under the Convention and AMLRCA. NMFS applicable regulations are found at 50 CFR Part 300, Subparts A and G.

NMFS will conduct a formal review of this EIS in 5 years to determine if a new or supplemental EIS is needed. In the interim, active U.S. participation in CCAMLR will allow NMFS to detect any significant change in circumstances that might warrant updating this EIS. If CCAMLR were to allow a new exploratory fishery while this EIS is in effect, NMFS would conduct an independent review or analysis of any new future exploratory fishery to see that the issuance of a U.S. AMLR harvesting permit would be consistent with the three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades. If NMFS concludes that issuance of the AMLR harvesting permit is consistent, there would be no additional NEPA analysis for the requested permit.

1.1 Background/Management History

At the Ninth Consultative Meeting of the Antarctic Treaty in 1977, representatives of the United States and other consultative parties expressed concern for the conservation of AMLR. The parties adopted Recommendation IX-2, which led to the establishment of the 1982 Convention and the Commision for the Consrvation of Antarctic Marine Living Resources (Commission or CCAMLR). CCAMLR governs AMLR for the purpose of protecting and conserving those marine living resources in the waters surrounding Antarctica. These resources include krill, icefish and other finfish, mollusks, crustacea, and all other species of living organisms. The Convention is based upon an ecosystem approach to the conservation of marine living resources and incorporates standards designed to ensure the conservation of individual populations and species and the Antarctic marine ecosystems as a whole.

The Convention established the following principles for the conservation of marine living resources:

(a) prevent decrease in the size of any harvested recruitment (for this purpose, its size should not be allowed to fall below a level close to that which ensures the greatest net annual recruitment);

(b) maintain ecological relationships between harvested, dependent, and related populations of Antarctic marine living resources, and restore depleted populations to the levels defined in (a) above; and

(c) prevent changes or minimize the risk of changes in the marine ecosystem that are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem, and the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.

The Convention applies to AMLR of the areas south of 60^{o} S and between that latitude and the Antarctic Convergence[1] that forms part of the Antarctic marine ecosystem, with three exceptions. The International Whaling Commission (IWC) addresses whale management globally, including in the Southern Ocean. The Convention on the Conservation of Antarctic Seals (CCAS) addresses seals. CCAS is implemented through meetings of the Parties to the Convention; there is no commission for the CCAS. France (not CCAMLR) is responsible for setting total allowable catches (TAC) of AMLR in the Exclusive Economic Zones (EEZs) surrounding the Kerguelen Islands (within Subdivision 58.5.1) and the Crozet Islands (within Subdivision 58.6); and South Africa (not CCAMLR) sets TACs within the EEZ surrounding the Prince Edward and Marion Islands (within Subdivision 58.7). In addition, the United Kingdom voluntarily gives effect to TACs set by CCAMLR for its EEZs in Subarea 48.3 (South Georgia) and Subarea 48.4 (the South Sandwich Islands). CCAMLR manages AMLR in the parts of these Subdivisions outside of the EEZs. Additional information about CCAMLR management practices can be found at www.ccamlr.org.

The United States is a Contracting Party to the Convention, as well as a Member of CCAMLR. CCAMLR's other member Nations include Argentina, Australia, Belgium, Brazil, Chile, European Union, France, Germany, India, Italy, Japan, Republic of Korea, Namibia, New Zealand, Norway, Poland, Russian Federation, South Africa, Spain, Sweden, Ukraine, United Kingdom, and Uruguay (note: Bulgaria, Canada, Finland, Greece, Mauritius, Netherlands, Peru, and Vanuatu have acceded to the Convention but are not members of the Commission). The function of CCAMLR is to give effect to the objectives and principles of the Convention.

Management of Convention Area Fisheries

The current CCAMLR Schedule of Conservation Measures in Force can be downloaded from www.ccamlr.org/pu/e/pubs/cm/drt.htm. In addition to the text of all conservation measures in force, the document includes a map of the Convention Area; the categories and codes used to classify conservation measures; a summary of current conservation measures and resolutions in force; the application of conservation measures to fisheries in the Convention Area; a history of conservation measures and resolutions; and a summary of conservation measures adopted each year. CCAMLR has adopted conservation measures related to: compliance; notifications of new and exploratory fisheries; gear regulation; data reporting; research and experiments; minimization of incidental mortality; fishing seasons: closed areas and prohibition of fishing; bycatch limits; toothfish; icefish; other finfish; krill; crab; squid; and protected areas. The Commission sets catch limits for both established (assessed) fisheries and new and exploratory fisheries.

[1]The Antarctic Convergence is deemed to be a line joining the following points along parallels of latitude and meridians of longitude: 50^{o} S, 0^{o}; 50^{o} S, 30^{o} E; 45^{o} S, 30^{o} E; 45^{o} S, 80^{o} E; 55^{o} S, 80^{o} E; 55^{o} S, 150^{o} E; 60^{o} S, 150^{o} E; 60^{o} S, 150^{o} W; 60^{o} S, 50^{o} W; 50^{o} S, 50^{o} W; and 50^{o} S, 0^{o}.

CCAMLR was the first international regional agreement to stipulate a precautionary ecosystem management approach (www.ccamlr.org). This approach considers the effects of any harvesting on dependant and associated species, not just the target species, and that ecological relationships be maintained.

A number of CCAMLR Committees report and make recommendations to the Commission, including a Scientific Committee (SC), which has two working groups plus an ad-hoc working group:

The Working Group on Fish Stock Assessment develops management advice, based on information provided by various Member scientists,

The Working Group on Ecosystem Monitoring and Management is concerned with analyzing data from the CCAMLR Ecosystem Monitoring Program, and

The Ad-hoc Working Group on Incidental Mortality Associated with Fishing (IMAF).

Advice from the Working Groups is submitted to the SC, which may also take into account any additional information. The SC then refers management advice to the Commission for consideration. Management measures agreed to by the Commission are reflected in Conservation Measures. CCAMLR meets annually in Hobart, Australia for a period of two weeks commencing in late October to discuss issues and organize management arrangements for the coming fishing seasons. The Commission is comprised of delegates from each Member country. The Department of State (DOS) heads the U.S. delegation. The United States plays a leading role at CCAMLR and meetings of the Commission, the SC and each of the Working Groups.

Participation by U.S. fishers in CCAMLR fisheries, particularly the toothfish fishery, provides many benefits to the United States, such as the provision of real-time information to NMFS concerning the sighting of other vessels on the fishing grounds. This information aids the enforcement of CCAMLR rules in general and the elimination of illegal, unregulated, and unreported (IUU) fishing, in particular. Additionally, U.S. vessels can and have provided a platform for NMFS' researchers in the Antarctic. Finally, trip reporting and observer data provide valuable information about AMLR to NMFS.

(1) Description of the Specific Area that May be Affected by the Action

The CCAMLR Convention applies to the Antarctic marine living resources of the area south of 60^{o} South latitude and to the Antarctic marine living resources of the area between that latitude and the Antarctic Convergence that form part of the Antarctic marine ecosystem. The Antarctic Convergence is a significant feature where colder polar waters meet more temperate waters to the north and forms an effective biological barrier to most Southern Ocean species. The Antarctic convergence is defined as the line joining the following points along parallels of latitude and meridians of longitude: 50° S 0°; 50° S, 30° E; 45° S, 30° E; 45° S, 80° E; 55° S, 80° E; 55° S, 150° E; 60° S, 150° E; 60° S, 50° W; 50° S, 50° W; 50° S, 0°. (See Sec. 1.1 of this DPEIS for a map of the CCAMLR Convention Area entitled "CCAMLR Prohibited Fishing Areas"). The Convention Area covers approximately 32.9 million square kilometers. The Antarctic marine ecosystem is referred to in the Convention as the complex of relationships of Antarctic marine living resources with each other and with their physical environment.

CCAMLR uses the Food and Agricultural Organization (FAO) Statistical Area notation to subdivide the Convention area into regions of management. The Convention Area is divided into three internationally agreed statistical areas:

Area 48 (Atlantic Ocean sector)
Area 58 (Indian Ocean sector)
Area 88 (Pacific Ocean sector)

Statistical areas are further divided in subareas, divisions and, if necessary, divisions are partitioned into two sections (a and b).

Because the scope of this DPEIS includes alternatives for harvesting controls within the NMFS CCAMLR regulatory program, longline testing trials to determine sink rates for compliance with Conservation Measure 24-02 are discussed in Sections 2.5 and 3.2. According to CM 24-02, any longline testing trials must be conducted outside the CCAMLR Convention Area; therefore, the area that may be affected by the action includes FAO statistical areas outside the CCAMLR Convention Area. The two ports where U.S. fishers have home ported or staged their CCAMLR fishing activities during the past decade are Punta Arenas, Chile (53° 11' S. latitude, 70° 56' W. longitude), and Montevideo, Uruguay (35° S. latitude, 56° 13' W. longitude). Cape Town, South Africa (33° 55' S. latitude, 18° 22' E. longitude) may be used by U.S. longline vessels in future years. We expect that any future longline testing trials would occur south of these three ports in FAO Statistical Areas 41 and 47 in the South Atlantic and in FAO Statistical Areas 87 and 81 in the South Pacific.

Sec. 3.2 contains a map "Longline Testing Trial Sites and CCAMLR Fishing Areas/Subareas" depicting the CCAMLR Convention Area and expected future longline testing trials as occurring south of 35° S. latitude outside the Convention Area and within FAO Statistical Areas 41, 47, 81, and 87.

(2) Fisheries Types

CCAMLR classifies its fisheries into three categories; assessed, new, and exploratory fisheries. Assessed fisheries are those where sufficient data exist to determine at least a preliminary stock assessment and where catch limits may be set based upon a statistical model. New fisheries are those where Member countries have notified CCAMLR that they intend to fish in an area or for a species or use a specific gear where fishing has not occurred previously.

Exploratory fisheries are new fisheries in subsequent years where fishing has not occurred to the extent that sufficient data are available to conduct a stock assessment. Because most areas, species or gears have been notified, in practice, CCAMLR classifies new and exploratory fisheries as "exploratory" and regulates as one type. This document follows that practice and therefore analyzes three fisheries; "assessed," "exploratory," and "future exploratory" (including "new" and "exploratory" fisheries).

Assessed (Established) Fisheries

For the 2003/04 fishing season CCAMLR set catch limits (See Table 3) for assessed fisheries as follows: (1) 4,420 metric tons (mt) for the longline fishery for *D. eleginoides* in Subarea 48.3, counting any catch of *D. eleginoides* taken in other finfish fisheries in Subarea 48.3 against the catch limit; (2) a combined catch limit of 2,873 mt for trawl fishing for *D. eleginoides* in Division 58.5.2 during the December 1, 2003, to November 30, 2004 season and for longline fishing for *D. eleginoides* in Division 58.5.2 west of 79^{o}20'E from May 1, 2004 to August 31, 2004; (3) 2,887 mt for *C. gunnari* in Subarea 48.3; (4) 292 mt for *C. gunnari* within defined areas of Division 58.5.2. The Commission agreed that the fishery for *E. carlsbergi* in Subarea 48.3 had lapsed. Consequently, the Commission has prohibited directed fishing on the species in Subarea 48.3 until further research has been conducted and a decision that the fishery be reopened is made by the Commission based on the advice of the SC.

The Commission carried forward the precautionary catch limits for krill in Area 48 at 4.0 million mt overall and, as divided by subareas, at 1.008 million mt in Subarea 48.1, 1.104 million mt in Subarea 48.2, 1.056 million mt in Subarea 48.3, and 0.832 million mt in Subarea 48.4.

Exploratory Fisheries

CCAMLR has adopted a measure that requires Members to notify the CCAMLR Secretariat when it is considering initiating an exploratory fishery in the Convention area. The notification must be received by the Secretariat not less than three months in advance of the next regular meeting of the Commission. The Member may not initiate the new fishery pending Commission review.

The notification to the Commission must be accompanied by as much of the following information as the Member is able to provide: (1) the nature of the proposed fishery including target species, methods of fishing, proposed region and any minimum level of catches that would be required to develop a viable fishery; (2) biological information from comprehensive research/survey cruises, such as distribution, abundance, demographic data and information on stock identity; (3) details of dependent and associated species and the likelihood of them being affected by the proposed fishery; and (4) information from other fisheries in the region or similar fisheries elsewhere that may assist in the valuation of potential yield.

Information on proposed new fisheries is considered by the SC, which then advises the Commission. After Commission review, the Commission takes action as it deems necessary.

An exploratory fishery continues to be classified as an exploratory fishery until sufficient information is available to evaluate the fishery's potential yield; to review its potential impacts on dependent and related species; and to allow the SC to formulate and provide advice to the Commission on appropriate harvest catch levels, effort levels, and fishing gear.

To ensure that adequate information is available to the SC for evaluation during the period when a fishery is classified as exploratory, the SC develops and annually updates a Data Collection Plan. Each Member active in the fishery annually submits to CCAMLR the data specified by the Data Collection Plan. Fishing capacity and effort is limited by a precautionary catch limit at a level not substantially above that necessary to obtain the data specified in the Data Collection Plan.

The Data Collection Plan includes, as appropriate: (1) a description of the catch, effort, and related biological, ecological, and environmental data required to undertake an evaluation of the fishery; (2) a plan for directing fishing effort during the exploratory phase to permit the acquisition of relevant data to evaluate the fishery potential and the ecological relationships among harvested, dependent, and related populations and the likelihood of adverse impacts; (3) a plan for the acquisition of any other research data by fishing vessels, including activities that may require cooperative activities of scientific observers and the vessel, as may be required for the SC to evaluate the fishery potential and the ecological relationships among harvested, dependent, and related populations and the likelihood of adverse impacts; and (4) an evaluation of the time-scales involved in determining the responses of harvested, dependent and related populations to fishing activities.

Each Member active in the fishery or intending to authorize a vessel to enter the fishery annually prepares and submits to CCAMLR a Research and Fishery Operations Plan. The plan is to include as much of the following as possible: (1) a description of how the Member's activities will comply with the Data Collection Plan developed by the SC; (2) the nature of the exploratory fishery, including target species, methods of fishing, proposed region and maximum catch levels proposed for the forthcoming season; (3) biological information from comprehensive research/survey cruises, such as distribution, abundance, demographic data, and information on stock identity; (4) details of dependent and related species and the likelihood of them being affected by the proposed fishery; and (5) information from other fisheries in the region or similar fisheries elsewhere that may assist in the evaluation of potential yield.

The Commission also designated, or continued the designation of, certain fisheries as exploratory fisheries during the 2003/04 fishing season. This recent fishing season provides the most current example of CCAMLR measures governing exploratory fisheries.

Several of the *Dissostichus* fisheries will be managed as exploratory fisheries. These fisheries are total allowable catch fisheries and are open only to the flagged vessels of countries that notified CCAMLR of an interest by named vessels in the fisheries. The exploratory fisheries for *Dissostichus* species authorized by the Commission for the 2003/2004 fishing season include the following: (1) longline fishing in Division 58.4.1 by Argentina, Australia and the United States; (2) longline fishing in Subarea 48.6 by Argentina, Japan, Namibia, New Zealand, Spain and South Africa; (3) longline fishing in Division 58.4.2 by Argentina, Australia, Russia, Ukraine and the United States; (4) longline fishing in Division 58.4.3a (the Elan Bank) outside areas under national jurisdiction by Argentina, Australia, Russia, Ukraine and the United States; (5) longline fishing in Division 58.4.3b (the BANZARE Bank) by Argentina, Australia, Russia, Ukraine and the United States; (6) trawl fishing in Division 58.4.3b (the BANZARE Bank) by one Australian vessel; (7) longline fishing in Subarea 88.1 by Argentina, Japan, Korea, New Zealand, Norway, Russia, South Africa, Spain, Ukraine, United Kingdom, United States and Uruguay; and (8) longline fishing in Subarea 88.2 by Argentina, Korea, New Zealand, Norway, Russia, South Africa and Ukraine. In addition, the Commission set a catch limit for Subarea 48.4, although no Member indicated an intention of fishing in the region.

The Commission set the total allowable catch level for the exploratory pot fishery for crab in Subarea 48.3 for the 2003/2004 fishing season at 1,600 mt and continued to limit participation to one vessel per member country.

The Commission set the total allowable catch limit for the exploratory jig fishery for squid, *Martialia hyadesi*, in Subarea 48.3 for the 2003/2004 fishing season at 2,500 mt.

The Commission limited the exploratory fishery for *Macrourus* species in Divisions 58.4.3a and 58.4.3b in the 2003/2004 fishing season to one Australian-flagged trawler and set the catch limits at 26 and 129 mt respectively.

The Commission also set a total precautionary catch limit in the exploratory fisheries in Division 58.4.2 of 2,000 mt with no more than 1,000 mt for spiny icefish, *Chaenodraco wilsoni,* and 500 mt each for striped-eye notothen, *Lepidonotothen kempi,* blunt scalyhead, *Trematomas eulepidotus,* and Antarctic silverfish, *Pleuragramma antarcticum*.

The Commission revised the limitations on bycatch in new and exploratory fisheries in Division 58.5.2 for the 2003/2004 season. The Commission also revised the bycatch limits in all new and exploratory fisheries for the 2003/2004 season in all areas containing Small Scale Research Units (SSRUs) (Subareas 48.6, 88.1 and 88.2, and Divisions 58.4.2, 58.4.3a, 58.4.3b) for all *Macrourus*, skates and rays, and other species.

At its 2003 annual meeting, the Commission revised its general measures for exploratory fisheries for *Dissostichus* species by removing catch limits in fine-scale rectangles; by removing soak time constraints for longlines; by revising the boundaries of SSRUs and introducing new SSRUs; and unless otherwise specified, by setting a catch limit of 100 mt in any SSRU excluding Subarea 88.2.

For the 2004/05 season, 26 notifications were made by 13 members for new or exploratory longline or trawl fisheries to fish for toothfish. A large number of the notifications were made for Subareas 88.1 (ten notifications for up to 21 vessels), 88.2 (five notifications for up to 10 vessels), and Divisions 58.4.1, 58.4.2, and 58.4.3b (between 7 and 11 vessels each).

Future Exploratory Fisheries

CCAMLR may, in the future, designate additional fisheries as new or exploratory fisheries. These would be fisheries not presently designated by CCAMLR as assessed, new or exploratory fisheries but for which Members in the future may express an interest in harvesting. If the SC recommends the designation of a fishery as a new or exploratory fishery, it will generate a Data Collection Plan for review by CCAMLR. If CCAMLR agrees to a future new or exploratory fishery, it will set catch limits based upon a comparison of the amount of fishable bottom habitat in the exploratory region with those in established fisheries and will use recruitment rates, etc. from the established areas. To ensure that catch limits are precautionary, CCAMLR will only allow a small proportion of the stocks to be taken. Each vessel participating in an exploratory fishery would be required to carry a scientific observer to ensure that data are collected in accorandance with an agreed Data Collection Plan, and to assist in collecting biological and other relvant data. The squid, crab and most toothfish fisheries are presently designated as exploratory fisheries. Future new or exploratory fisheries could include finfish not currently fished but for which members feel there is a market for the fish and technology to harvest them.

(3) Assessment Methods:

Calculation of Precautionary Catch Limits for Assessed Fisheries

The model currently used by CCAMLR for its management of the assessed fisheries to determine precautionary catch limits is the Generalized Yield Model (GYM). The stock assessment approaches and the GYM are accepted within the CCAMLR scientific community as the most appropriate methodology for the species concerned, taking into account the extent of knowledge about the species' biology and stock size. These approaches are published in the peer-reviewed literature (Constable & de la Mare 1996, de la Mare *et al*, 1998) and have received wider publication in other international fora, such as the 1999 Conference on the Ecosystem Effects of Fishing (Constable *et al* 2000). The GYM was derived from a population model referred to as the krill yield model. Development of the model was partially motivated by concerns raised in 1990, when estimates of krill biomass near South Georgia were only 600,000 mt and the localized fishery was taking as much as one third of this amount each year (SC-CCAMLR, 1990). The krill yield model (Butterworth *et al.*, 1991) is based on a simple approach proposed for fish stocks by Beddington and Cooke in 1983. This approach involves the determination of a factor (γ), the proportion of unexploited biomass that can be caught each year. The essential conditions of this approach are (1) the availability of a single estimate of the resource biomass prior to the initiation of harvest; (2) the assumption that annual recruitment does not fall as the spawning stock size drops; and (3) the evaluation of a potential yield that satisfies a risk criterion to minimize the probability of impairing recruitment (de la Mare, 1994a).

With respect to the specific nature of krill and the krill fishery, additional modifications allowed for:

(1) strong seasonal effects such as all somatic growth occurring during 3 months of the year; (2) the possibility that the fishing season may not extend throughout the entire year; (3) imprecision of the survey estimate of biomass; and (4) uncertainties in the estimates of biological parameters such as recruitment and natural mortality (SC-CAMLR, 1991; Butterworth *et al*., 1994). The population model is an age-structured model that relies on the following information for its catch limit calculations: (1) an initial estimate of the total biomass of the krill stock in an area; (2) an estimate of the rate of natural mortality; (3) a simulation model of krill populations; and (4) an estimate of the interannual variability in recruitment. It has the form:

$$\mathbf{Y} = \gamma \mathbf{B_0}$$

where $\mathbf{Y}$ is the annual krill yield; γ is the proportion of the biomass that can be caught each year; and $\mathbf{B_0}$ is a measure of the total biomass prior to exploitation.

Year-to-year krill variability is accommodated by a simulation model, which includes random variability in recruitment and is used to calculate a distribution of population sizes both in the absence of fishing and at various levels of fishing mortality. This simulation model is run with varying values for growth, mortality, and abundance drawn at random from defined distributions, allowing for the incorporation of natural variability and uncertainty in measurement. The resulting distributions are used to determine γ. The greater the value of γ(the proportion of the biomass that can be caught each year), the higher the permitted fishing intensity. CCAMLR has developed a three-part decision rule for determining the value of γ:

1. Choose γ_1 so that the probability of the spawning biomass dropping below 20% of its pre-exploitation median level over a 20-year harvesting period is 10%,

2. Choose γ_2 so that the median level of krill spawning biomass in *the exploited* stock over a 20-year period is 75% of the pre-exploitation median level, and

3. Select the lower of γ_1 and γ_2 as the level of γ for the calculation of krill yield (SC-CAMLR, 1991).

The first two decision criteria correspond to values of γ: γ_1 concerns the probability that krill spawning biomass will drop below a sustainable level, and γ_2 attempts to address the needs of the krill predators. In an ecosystem context, these criteria are followed to ensure that there is not only a sustainable level of krill production, but also that the needs of all of the predators are safeguarded (Everson and de la Mare, 1996). Because detailed modeling on how the krill fishery might impact krill predators has yet to provide reliable quantitative results, an *ad hoc* approach is utilized in determining γ_2. Specifically, criterion 2 defines a value for γ where the minimal biomass is 75% of the pre-fishing level; the 75% level is chosen as the midpoint between taking no account of the needs of predators (biomass = 50% of the pre-fishing level) and providing complete protection for the krill feeding animals (biomass = 100% of the pre-fishing level). Once criteria 1 and 2 have been established, the lower of the two values of γ is selected (SC-CAMLR, 1994). The other critical parameter used in this model ($\mathbf{B_0}$, the pre-exploitation level of krill biomass) was derived from the results of a synoptic survey of Area 48 in 2000 (SC-CAMLR, 2000). Krill biomass for Divisions 58.4.1 (SC-CAMLR, 1996) and 58.4.2 (SC-CAMLR, 1995) were determined from surveys.

Calculation of Precautionary Catch Limits for New and Exploratory Fisheries

In the case of new and exploratory fisheries, there is little to no information to draw upon regarding distribution and abundance of the target species, and no fishery independent surveys to estimate recruitment or standing stock. Thus, it is not feasible to conduct a formal stock assessment to evaluate long term precautionary yield as is done in established fisheries. The CCAMLR Convention stipulates that the expansion of a new fishery must not proceed faster than the acquisition of information necessary to ensure that the fishery can and will be conducted in accordance with the principles of the Article II. Thus, advice for new and exploratory fishery catch levels must be made available to the Commission using precautionary principles.

The approach adopted by CCAMLR to estimate precautionary yield relies on aspects of the new and exploratory statistical area under consideration, and information from assessments of established fisheries for *D. eleginiodes* in Subarea 48.3 and Division 58.5.2. The fishable seabed areas of the proposed new and exploratory statistical area are determined as 0 to 600 m (representative of juvenile habitat), 600 to 1,800 m (longline fishing depths) and 500 to 1,500 m (trawl fishing depths). The calculation of precautionary yield includes the following elements: (1) proportional adjustments for areas of fishable seabed and latitudinal zones are computed; (2) calculations using the GYM with biological and fishery parameters (including recruitment estimates) from assessed fisheries set at the values most appropriate for the area under consideration are performed; (3) allowances are made for the recent catch history, including unreported catches.

This estimate of yield is further adjusted by an agreed proportion (e.g., 50%) and a precautionary limit for the new or exploratory fishery is set. It is well recognized that this estimate may not represent an accurate assessment of potential yield in areas subject to new and exploratory fisheries.

Once the fishery commences in the area, all relevant conservation measures, data collection procedures, and submission requirement apply, including all bycatch mitigation measures. As required fishery research plans are implemented, this allows subsequent refinement of precautionary yields in subsequent fishing seasons.

(4) Harvest Levels:

U.S. Fisheries

U.S. vessels have had limited participation in Convention Area fisheries. Seven vessels have held permits since 1991 to fish in the crab, krill or toothfish fisheries. Two vessels participated in the crab fishery in Subarea 48.3. One vessel harvested 299 mt in 1992/93, but found it difficult to market the product. A second vessel harvested 283 mt during 1995/96 and 214 mt during 1995/96 (one trip spanning two seasons), but surrendered its permit because it did not consider the fishery to be economically viable. One krill vessel has participated in the krill fishery in Convention in Area 48 during four seasons, harvesting 70 mt in the 1999/2000 season; 1,561 mt in the 2000/01 season; 12,175 mt in the 2001/02 season; 10,150 mt in the 2002/03 season; and 8,900 mt during the 2003/04 year. The vessel has been granted an extension of its 2003/2004 permit allowing it to take the 21,100 mt remaining on the permit during the 2004/05 season. One U.S. vessel harvested 178 mt of toothfish in 1996, but chose not to seek a second AMLR permit. Two vessels harvested a total of 187 mt of toothfish in Subarea 88.1 during the 2003/04 year. The owner of the vessel had requested additional permits to fish in other areas, but sold his vessels prior to the issuance of those permits.

CCAMLR Fisheries

Summaries of all commercial harvests in the Convention Area during the last decade (1993/94 - 2003/04) are provided in CCAMLR's Statistical Bulletin, published annually for the latest decade. Catches by area and season, catch limits by area and season, and maximum CCAMLR catch limits for each fishery are provided in Tables 1, 2, and 3, respectively.

Table 1 (Sec. 1.1): Catch (mt) for each species in assessed and exploratory CCAMLR fisheries during the 1993/94 through 2002/03 period.

ASSESSED FISHERIES	03[a]	02	01	00	99	98	97	96	95	94
TOOTHFISH										
48.3	7,528	5,742	4,047	4,904	3,636	3,201	3,812	3,602	3,371	658
58.5.2	2,844	2,756	2,980	3,566	3,547	3,765	1,927			
ICEFISH										
48.3	1,986	2,667	960	4,114	265	6			10	13
58.5.2	2,345	865	1,136	137	2	115	227			
KRILL										
48										
48.1	35,288	10,646	46,778	71,977	38,895	56,575	48,843	61,964	38,165	45,085
48.2	15,427	72,060	4,981	16,891	62,077	6,673	99	2,734	48,833	19,259
48.3	66,151	43,282	52,423	25,557	985	26,776	26,711	26,452	47,421	20,301
58.4.1									1,266	899
58.4.2										

EXPLORATORY FISHERIES	03[a]	02	01	00	99	98	97	96	95	94
TOOTHFISH										
48.4										
48.6										
58.4.2					0		0			
58.4.3a										
58.4.3b										
88.1	1,831	1,325	660	751	297	42	0			
88.2	106	41								
58.4.1										
CRABS										
48.3		112	15	2	2				214	283
SQUID										
48.3			2				81	52		
MACROURUS										
58.4.3a										
58.4.3a										
FOUR SPECIES[b]										
53.4.2										

a - Season denoted by ending year (e.g., 03 denotes the season beginning December 1, 2002 and ending November 30, 2003).

b – Spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*).

Table 2 (Sec. 1.1): CCAMLR catch limits for assessed and exploratory fisheries during the 2004 -1994 period.

ASSESSED FISHERIES	04[a]	03	02	01	00	99	98	97	96	95	94
TOOTHFISH											
48.3	4,420	7,810	5,820	4,500	5,310	3,500	3,300	5,000	4,000	2,800	1,300
58.5.2	2,873	2,879	2,815	2,995	3,585	3,690	3,700	3,800	297	297	
ICEFISH											
48.3	2,887	2,181	5,557	6,760	4,036	4,840	4,520	1,300	1,000	0	9,200
58.5.2	292	2,980	885	1,150	916	1,160	900	311	311	311	
KRILL											
48	4M	4M	4M	4M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
48.1	1,008K	1,008K	1,008K	1008K							
48.2	1,104K	1,104K	1,104K	1104K							
48.3	1,056K	1,056K	1,056K	1056K							
48.4	832K	832K	832K	832K							
58.4.1	440K	440K	440K	440K	775K	775K	775K	775K			
58.4.2	450K	450K	450K	450K	450K	450K	450K	450K	450K	390K	390K

EXPLORATORY FISHERIES	04[a]	03	02	01	00	99	98	97	96	95	94
TOOTHFISH											
48.4	28	28	28	28	28	28	28	28	28	28	
48.6	910	910	910	910	910	910		1,980			
58.4.2	500	500	500	500							
58.4.3a	250	250	250	300	450	625	1,782	1,980	200		
58.4.3b	300	300	300	345	345						
88.1	3,250	3,760	2,508	2,064	2,090	2,281	1,510	1,980			
88.2	375	375	250	250	250						
58.4.1	800			150	150	261					
CRABS											
48.3	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
SQUID											
48.3	2,500	2,500	2,500	2,500	2,500	2,500	2,500				
MACROURUS											
58.4.3a	26										
58.4.3b	159										
FOUR SPECIES[b]											
58.4.2	2,000			1,500	1,500						

a - Season denoted by ending year (e.g., 04 denotes the season beginning December 1, 2003 and ending November 30, 2004).

b – Spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*).

Table 3 (Sec. 1.1): CCAMLR 2003/04 season catch limits and maximum catches during any one year during the last decade (1994-2004).

SPECIES/ REGION	**FISHING GEAR**	**2003/04 CATCH LIMIT** (Mt)	**1994-2004 MAXIMUM CATCH** (Mt)	**SEASON OF MAX CATCH***	**CONSERVATION MEASURE**
ASSESSED FISHERIES					
Toothfish/48.3	Longline/pot	4,420	7,528	03	41-02
Toothfish/58.5.2	Longline/trawl	2,873	3,765	98	41-08
Icefish/48.3	Trawl	2,887	4,114	00	42-01
Icefish/58.5.2	Trawl	292	2,345	03	42-02
Krill/48	Trawl	4 million			51-01
Krill/48.1	Trawl	1,008K	71,977	96	
Krill/48.2	Trawl	1,104K	72,060	02	
Krill/48.3	Trawl	1,056K	66,151	03	
Krill/48.4	Trawl	832K	0		
Krill/58.4.1	Trawl	440K	1,266	95	51-02
Krill/58.4.2	Trawl	450K	0		51-03

EXPLORATORY FISHERIES					
Toothfish/48.4	Longline	28	0		41-03
Toothfish/48.6	Longline	910	0		41-04
Toothfish/58.4.2	Longline	500	<0.5	99	41-05
Toothfish/58.4.3a	Longline	250	0		41-06
Toothfish/58.4.3.b	Longline,Trawl	300	0		41-07
Toothfish/88.1	Longline	3,250	1,831	03	41-09
Toothfish/88.2	Longline	375	106	03	41-10
Toothfish/58.4.1	Longline	800	0		41-11
Crabs/48.3	Pot	1,600	283	95	52-01
Squid/48.3	Jig	2,500	81	97	61-01
Macrourus spp. /58.4.3a	Trawl	26	0		43-02
Macrourus spp. /58.4.3b	Trawl	159	0		43-03
Four Species[b]/58.4.2	Trawl	2,000	11		43-*04*

a -Season denoted by ending year (e.g., 95 denotes the season beginning December 1, 1994 and ending November 30, 1995).

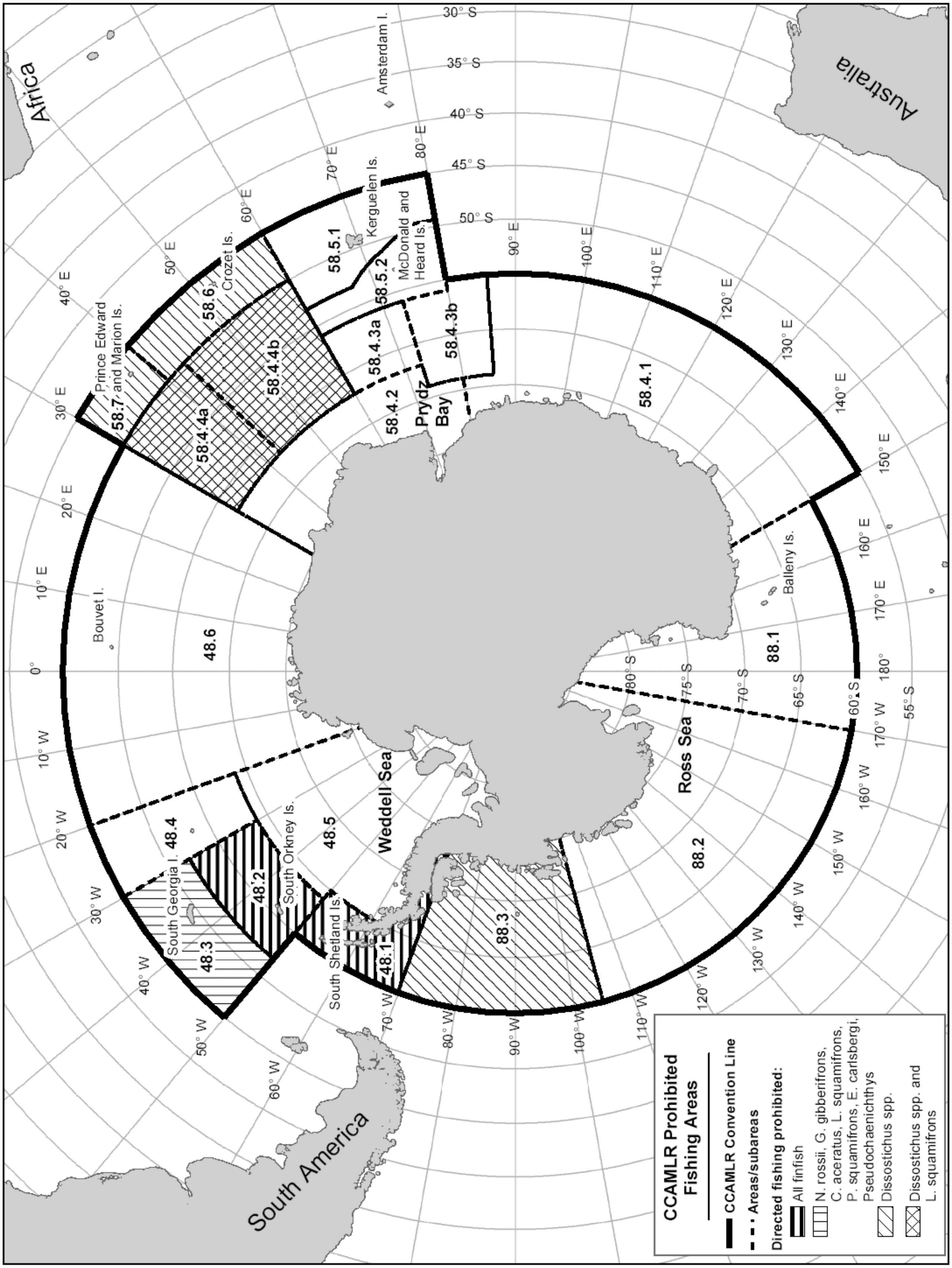
b – Spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*).

(5) CCAMLR Management Regulations:

CCAMLR manages its fisheries by, among other things, setting total allowable catches by fishing area, subarea, and division. There is no allocation of catch quota among individual Members or Member vessels. CCAMLR does limit participation in a few of the fisheries it manages. Participation in new and exploratory fisheries is limited to the vessels of Members who notify the CCAMLR Secretariat no later than 90 days before the annual meeting of CCAMLR and whose Research and Fisheries Operations Plan is approved by the SC. The fishery for crab is limited to one vessel per Member country. However, in no case, even in the case of limited participation, is any of the total allowable catch set for a fishery further allocated among participants in the fishery.

Prohibited Fisheries

Directed fishing for all finfish is prohibited by CCAMLR in Subareas 48.1 and 48.2; for marbled rockcod (*Notothenia rossii*), humped rockcod (*Gobionotothen gibberifrons*), blackfin icefish *(Chaenocephalus aceratus*), South Georgeia icefish (*Pseudochaenichthys georgianus*), grey rockcod (*Lepidonotothen squamifrons*), Patagonian rockcod (*Patagonotothen guntheri*), and lanternfish (*Electrona carlsbergi*) in Subarea 48.3; for *Lepidonotothen squamifrons* in Subdivision 58.4.4; and for toothfish (*Dissostichus*) species in Subarea 88.3, Subdivision 58.4.4 and Subareas 58.6 and 58.7 outside areas of national jurisdiction. These prohibitions remain in effect until such time that further scientific information is gathered and reviewed by the SC and its Working Group on Fish Stock Assessment (WG-FSA).



CCAMLR Prohibited Fishing Areas
CCAMLR Convention Line
Areas/subareas
Directed fishing prohibited:
All finfish
N. rossii, G. gibberifrons, C. aceratus, L. squamifrons, P. squamifrons, E. carlsbergi, Pseudochaenichthys
Dissostichus spp.
Dissostichus spp. and L. squamifrons
Africa
Australia
South America
Amsterdam I.
Kerguelen Is.
McDonald and Heard Is.
Crozet Is.
Prince Edward and Marion Is.
Bouvet I.
Balleny Is.
South Georgia I.
South Orkney Is.
South Shetland Is.
Weddell Sea
Ross Sea
Prydz Bay
58.5.1
58.5.2
58.6
58.4.4b
58.4.4a
58.7
58.4.3a
58.4.3b
58.4.2
58.4.1
48.6
48.4
48.2
48.3
48.5
48.1
88.3
88.2
88.1

Bycatch of Finfish and Invertebrates

CCAMLR first addressed the bycatch of finfish in its resolutions adopted in 1985 and 1986 specific to *Notothenia rossii* in Subareas 48.1, 48.2 and 48.3. Pursuant to CCAMLR Conservation Measure 33-01, bycatch limits are presently in force with respect to *Gobionotothen gibberifron, Chaenocephalus aceratus, Pseudochaenichthys georgianus, Notothenia rossii* and *Lepidonotothen squamifonrs* in Statistical Subarea 48.3. In any directed fishery in Statistical Subarea 48.3 in any fishing season, the bycatch of *Gobionotothen gibberifrons* may not exceed 1,470 mt; the bycatch of *Chaenocephalus aceratus* may not exceed 2,200 mt; and the bycatch of *Pseudochaenichthys georgianus, Notothenia rossii* and *Lepidonotothen squamifrons* may not exceed 300 mt each. These limits will be kept under review by CCAMLR taking into account the advice of the SC.

Bycatch limits are also presently in force with respect to any species other than *Disssotichus eleginoides* and *Champsocephalus gunnari* in Statistical Division 58.5.2. This measure (CCAMLR Conservation Measure 33-02) limits the bycatch of *Channichthys rhinoceratus*, *Lepidonotothen squamifrons, Macrourus spp.* and skates and rays not to exceed specific amounts. The bycatch of species not mentioned in the measure, and for which there is no other catch limit in force, is set at 50 mt. If in the course of a directed fishery, the bycatch of any one haul of *Channichthys rhinoceratus, Lepidonotothen squamifrons*, *Macrourus spp.* or skates and rays is equal to, or greater than 2 mt, then the fishing vessel may not fish using that method of fishing at any point within 5 nautical miles of the location where the bycatch exceeded 2 mt for a period of at least five days. The location where the bycatch exceeded 2 mt is defined as the path followed by the fishing vessel. If, in the course of a directed fishery, the bycatch of any one haul of any other bycatch species for which bycatch limits apply under Conservation Measure 33-02 is equal to, or greater than 1 mt, then the fishing vessel may not fish using that method of fishing at any point within 5 nautical miles of the location where the bycatch exceeded 1 mt for period of at least five days. The location where the bycatch exceeded 1 mt is defined as the path followed by the fishing vessel. These provisions may be referred to as “move along” provisions.

CCAMLR Conservation Measure 33-03 limits bycatch in new and exploratory fisheries in all areas containing small-scale research units (SSRU) except where specific bycatch conservation measures apply. The catch limits for all bycatch species are set out in an annex. Within these catch limits, the total catch of bycatch species in any SSRU may not exceed a certain percentage of the catch limit or a tonnage, whichever is greater. “Move along” provisions similar to those applied in Statistical Division 58.5.2 apply within the SSRUs.

1.2 Need for Action and Objectives

NMFS has previously issued four environmental assessments (EAs) and one supplemental EA relating to CCAMLR, with the most recent pertaining to AMLR harvesting and trade. In 1986, NMFS prepared an EA that analyzed the effects on the human environment of the regulations that implemented the AMLRCA, the statute that gave force and effect to the United States' obligations. This EA addressed the Convention and the entity established by the Convention, CCAMLR. This Convention established international mechanisms and created legal obligations necessary for the protection and conservation of AMLR. The Department of State publishes an annual Federal Register notice of conservation and other measures adopted by each annual meeting of CCAMLR and solicits comments during a 30-day comment period. These measures are binding on U.S. nationals under authority of the High Seas Fishing Compliance Act (16 USC 5501 *et seq*.; see 50 CFR Part 300, Subpart B) and the AMLRCA (16 USC 2431 *et seq*.; see 50 CFR Part 300, Subparts A and G).

In 2000, NMFS prepared an EA that analyzed the effects of CCAMLR's toothfish Catch Documentation Scheme (CDS) on the importation of toothfish into the United States. As a part of that analysis, NMFS looked at the fishery-wide effects on the human environment of the harvesting and trade sectors for toothfish. This analysis was critical to the implementation of the CDS, a scheme developed by CCAMLR to curtail the negative effects on toothfish stocks of Illegal, Unregulated, and Unreported (IUU) fishing targeting toothfish. In 2003, NMFS prepared an EA that analyzed the effects on the human environment of a pre-approval process for the importation of toothfish into the United States. This EA also addressed other elements of a regulatory amendment, including the definition of CCAMLR fishing season and the required use of an automated satellite-linked vessel monitoring system (VMS) for U.S. vessels harvesting AMLR in the Convention waters. The pre-approval process was created by NMFS to streamline the administration of the CDS and enhance efforts to prevent and discourage unlawful harvest and trade in toothfish. In March 2004, NMFS prepared an EA that analyzed the effects of issuing an AMLRCA harvesting permit to a U.S. vessel to harvest krill in Convention Area 48. This EA was supplemented in November 2004 to extend the vessel's harvesting permit for one year in order to allow the vessel to take the remaining allowable catch for krill in Area 48.

Each of the previous EAs led to a finding of no significant impact to the human environment, and, thus, no EIS was prepared. However, based on the information presented to CCAMLR by its Scientific Committee (SC) in the years since 1986, trade tracking and monitoring of toothfish, and an increase in the number of U.S. participants in AMLR fisheries, NMFS has prepared this DPEIS to examine the effects of these changes to AMLR fisheries on the human environment. At this time, NMFS is unaware of the need to change the way in which it implements the conservation and management measures adopted by CCAMLR; however, this DPEIS may cause NMFS to reconsider the need for change.

With the exception of two sections, all of NMFS regulations codified at 50 CFR Part 300, Subparts A and G were examined in the preparation of this DPEIS. The two CCAMLR regulatory sections that were not considered for change are: (1) Sec. 300.104 - Scientific Research, because Antarctic Conservation Permits for scientific research are issued by the National Science Foundation and not by NMFS; and (2) Sec. 300.117 –

Penalties, because this section is statutorily driven and cannot be changed without legislative amendment.

SECTION 2.0 ALTERNATIVES

The alternatives are designed to address the following four issues:
(1) Is the U.S. regulatory process for **controls on harvesting** (catch limits, time/area restrictions, gear restrictions, bycatch restrictions) effective?;
(2) Is the U.S. regulatory process for **controls on trade** (DCD-Dissostichus Catch Documentation scheme, including dealer permits, import permits, re-export permits, pre-approval of DCDs, and bans on trade in toothfish harvested in Areas 51 and 57) effective?;
(3) Is the U.S. regulatory process for **controlling research** on AMLR (CCAMLR Ecosystem Monitoring Program - CEMP permits, and international observer requirements) effective?; and
(4) Is the U.S. regulatory process to ensure **enforcement** (include VMS, adequacy of information collection) effective?

An examination of these four issues led to various options or alternatives to consider.

2.1 <u>Harvesting Controls</u>

I. ACTION: <u>Impose harvest limits</u> on amounts of AMLR that may be caught by U.S. vessels in "assessed (established) fisheries" (fisheries about which sufficient fisheries dependent and fisheries independent data are available to estimate a preliminary level of biomass): "exploratory fisheries" (fisheries about which little or no data exist upon which to estimate a preliminary level of biomass and for which a Research and Fisheries Operation Plan has been submitted and approved by the CCAMLR Scientific Committee); and "future exploratory fisheries" (fisheries about which little or no data exist upon which to estimate a preliminary level of biomass and for which a Research and Fisheries Operation Plan must be submitted to the CCAMLR Scientific Committee for review and approval before a fishery can take place).

CCAMLR assessed fisheries are for toothfish in Subarea 48.3 and Division 58.5.2, icefish in Subarea 48.3 and Division 58.5.2, and krill in parts of Area 48 and Divisions 58.4.1 and 58.4.2 (Table 1). CCAMLR exploratory fisheries are for several species in several subareas and divisions (See above and Table 1). For most fisheries Conservation Measures are reviewed and revised annually, but for others (e.g., krill) Conservation Measures remain in force until new scientific data are available which support a change. AMLR harvesting permits issued by NMFS reflect all continuing measures and annual revisions. All harvesting by vessels subject to U.S. jurisdiction shall not exceed the CCAMLR catch limits (i.e., the catch limits set by CCAMLR for all member countries). CCAMLR sets an overall catch limit by species by area and the CCAMLR catch limits function as caps on all international harvest by member countries in CCAMLR waters. No country receives an individual allocation of any CCAMLR catch limit. Limits should include bycatch amounts, to the extent that it is practicable.

Alternatives examined for each fishery include the "status quo" as now in place, a more strict alternative, a less strict alternative and a prohibition of the management activity. The less strict alternative taken is to allow twice the largest amount of annual international harvest during the last decade (1993-2003); the more strict alternative taken is to only allow one half the largest historical harvest in the past decade; and the prohibition alternative is to allow no take. These alternatives were chosen to bracket the status quo to identify the appropriate management measure. The decade 1993-2003 was chosen for the analysis of less strict and more strict alternatives because, at the time the alternatives were drafted, this was the most recent time period during which the United States had vessels fishing in CCAMLR management waters, and because summaries of all commercial harvests in CCAMLR waters during the last decade are provided in CCAMLR's Statistical Bulletin and published annually for the latest decade. Consideration of alternatives allowing twice (or even one half) the historical maximum may mean consideration of catch levels greater than the current catch limit. That would not be allowed under the current conservation measure, unless the United States objected to a measure within 90 days of its notification by the CCAMLR Secretariat. However, for purposes of analyzing a broad range of alternatives, it is assumed that in the future new data may become available that would make this alternative viable. Further, a broad range of alternatives is analyzed in the DPEIS that NMFS may use to meet NEPA analytical requirements for future regulations or permit issuance.

In the future, CCAMLR may consider setting catch limits for additional new or exploratory fisheries. This would occur when the CCAMLR Secretariat is notified of the intention of a Member to undertake a fishery not previously or not recently prosecuted. In this case, the Scientific Committee would review the Research and Fishery Operations Plan(s) submitted along with the notifications and advise CCAMLR on whether or not to set a catch limit for the fishery. Such notifications are possible for any finfish, krill or other fishery in an area not previously or recently fished and could, for example, be notified for krill fishing in Area 88.

ASSESSED FISHERIES:

A. Toothfish harvesting in Subarea 48.3.

Alternative A1: Issue permits annually in Subarea 48.3 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the toothfish longline fishery in Subarea 48.3 for each year during the last decade are provided in Table 1. Catch limits for the fishery for each year during this period are provided in Table 2. The precautionary catch limits were determined using the GYM based upon fisheries independent (research surveys) and fisheries dependent (fisheries catch data including both regulated and IUU catch) data. Because decision rules used by the GYM are precautionary in design, harvesting toothfish at or below the catch limit should not impact sustainable yield.

Alternative A2: Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Subarea 48.3 by season limiting harvest to 15,056 mt (twice the largest amount of annual international harvest during the period from 1993-2003).

The maximum catch in Subarea 48.3 during the last decade was 7,528 mt for the 2002/2003 fishing season. This alternative would exceed the 2003/2004 catch limit of 4,420 mt. However, this alternative does not contemplate issuing permits to harvest toothfish in Subarea 48.3 at any level that would exceed the then current CCAMLR catch limit; it assumes that the then current catch limit would exceed 15,056 mt.

Failure to meet an obligation would be a violation of Article IX of the CCAMLR, however, it does provide a mechanism for objecting to a Conservation Measure. If a Member has not objected to a measure within 90 days of its notification by the CCAMLR Secretariat, the Member is bound to give it effect. Failure to do so is a violation of the treaty obligation under the Convention.

Alternative A3: Issue permits annually in Subarea 48.3 by season and by limiting harvest to 3,764 mt (half the largest amount of annual international harvest during the period from 1993-2003).

One half of the maximum annual harvest during this period would be less than the 2003/2004 catch limit for Subarea 48.3. If the United States were the only nation fishing in this region, this alternative would result in a reduction in the catch. However, limiting the U.S. catch would not necessarily ensure that the catch limit was reduced or not harvested because other Members have historically harvested amounts approaching the catch limit.

Alternative A4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

Similar to Alternative A3, if the United States were the only nation fishing in this subarea, this alternative would result in zero catch. However, prohibiting U.S. catch would not ensure that the catch limit was not reached because other Members have historically harvested amounts approaching the catch limit.

B. Toothfish harvesting in Division 58.5.2.

Alternative B1: Issue permits annually in Division 58.5.2 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the toothfish longline fishery in Division 58.5.2 for each year during the last decade are provided in Table 1. Catch limits for the fishery for each year during this period are provided in Table 2. The precautionary catch limits were determined using the GYM based upon fisheries independent (research surveys) and fisheries dependent (fisheries catch data including both regulated and IUU catch) data. Because decision rules used by the GYM are precautionary in design, harvesting toothfish at or below the catch limit should not impact sustainable yield.

Alternative B2: Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Division 58.5.2 by season limiting harvest to 7,530 mt (twice the largest amount of annual international harvest during the period from 1993-2003).

The maximum catch in Subarea 48.3 during the last decade was 3,765 mt for the 1998/99 fishery. This alternative would exceed the current catch limit of 2,873 mt. However, this alternative does not contemplate issuing permits to harvest toothfish in Division 58.5.2 at any level that would exceed the then current CCAMLR catch limit; it assumes that the then current catch limit would exceed 7,530 mt.

Failure to meet an obligation would be a violation of Article IX of the CCAMLR, however, it does provide a mechanism for objecting to a Conservation Measure. If a Member has not objected to a measure within 90 days of its notification by the CCAMLR Secretariat, the Member is bound to give it effect. Failure to do so is a violation of the treaty obligation under the Convention.

Alternative B3: Issue permits annually in Division 58.5.2 by season and by limiting harvest to 1,883 mt (half the largest amount of annual international harvest during the period from 1993-2003).

One half of the maximum annual harvest during this period would be less than the 2003/2004 catch limit for Division 58.5.2. If the United States were the only nation fishing in this region, this alternative would result in a reduction in the catch. However, limiting the U.S. catch would not necessarily ensure that the catch limit was reduced or not harvested because other Members have historically harvested amounts approaching the catch limit.

Alternative B4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

Similar to Alternative B3, if the United States were the only nation fishing in this subarea, this alternative would result in zero catch. However, prohibiting U.S. catch would not ensure that the catch limit was not reached because other Members have historically harvested amounts approaching the catch limit.

C. Icefish harvesting in Subarea 48.3.

Alternative C1: Issue permits annually in Subarea 48.3 by season and within the CCAMLR catch limits on vessels participating in the icefish trawl fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the icefish trawl fishery in Subarea 48.3 for each year during the last decade are provided in Table 1. Catch limits for the fishery for each year during this period are provided in Table 2. The precautionary catch limits were determined using the GYM based upon fisheries independent (research surveys) and fisheries dependent (fisheries catch) data. Because decision rules used by the GYM are precautionary in design, harvesting icefish at or below the catch limit should not impact sustainable yield.

Alternative C2: Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Subarea 48.3 by season limiting harvest to 8,228 mt (twice the largest amount of annual international harvest during the period from 1993-2003).

The maximum catch in Subarea 48.3 during the last decade was 4,114 mt for the 1999/2000 fishery. This alternative would exceed the current catch limit of 2,887 mt. However, this alternative does not contemplate issuing permits to harvest icefish in Subarea 48.3 at any level that would exceed the then current CCAMLR catch limit; to do so would be unlawful.

Failure to meet an obligation would be a violation of Article IX of the CCAMLR, however, it does provide a mechanism for objecting to a Conservation Measure. If a Member has not objected to a measure within 90 days of its notification by the CCAMLR Secretariat, the Member is bound to give it effect. Failure to do so is a violation of the treaty obligation under the Convention.

Alternative C3: Issue permits annually in Subarea 48.3 by season and by limiting harvest to 2,057 mt (half the largest amount of annual international harvest during the period from 1993-2003).

One half of the maximum annual harvested during this period would be less than the current catch limit for Subarea 48.3. If the United States were the only nation fishing in this region, this alternative would result in a reduction in the catch. However, limiting the U.S. catch would not necessarily ensure that the catch limit was reduced or not harvested because other Members have historically harvested amounts approaching the catch limit.

Alternative C4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

Similar to Alternative A3, if the United States were the only nation fishing in this subarea, this alternative would result in zero catch. However, prohibiting U.S. catch would not ensure that the catch limit was not reached because other Members have historically harvested amounts approaching the catch limit.

D. Icefish harvesting in Division 58.5.2.

Alternative D1: Issue permits annually in Division 58.5.2 by season and within the CCAMLR catch limits on vessels participating in the icefish trawl fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the icefish trawl fishery in Division 58.5.2 for each year during the last decade are provided in Table 1. Catch limits for the fishery for each year during this period are provided in Table 2. The precautionary catch limits were determined using the GYM based upon fisheries independent (research surveys) and fisheries dependent (fisheries catch) data. Because decision rules used by the GYM are precautionary in design, harvesting icefish at or below the catch limit should not impact sustainable yield.

Alternative D2: Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Division 58.5.2 by season limiting harvest to 4,690 mt (twice the largest amount of annual international harvest during the period from 1993-2003).

The maximum catch in Division 58.5.2 during the last decade was 2,345 mt for the 2002/03 fishery. This alternative would exceed the current catch limit of 292 mt. However, this alternative does not contemplate issuing permits to harvest icefish in Subarea 48.3 at any level that would exceed the then current CCAMLR catch limit; to do so would be unlawful. It should be noted that the catch limit in Division 58.5.2 was reduced from 2,980 mt for the 2002/03 year to 292 mt for 2003/04 season as a result of new data being available from a research survey. Icefish populations usually consist of one or two strong year classes and as these decrease from age, the population size may decrease until the next strong year class is recruited. It is therefore likely that the next new survey will provide indications of a new year class strength entering the fishery and the catch limit would be adjusted accordingly. These surveys are conducted by Australia on a semi-annual basis.

Failure to meet an obligation would be a violation of Article IX of the CCAMLR, however, it does provide a mechanism for objecting to a Conservation Measure. If a Member has not objected to a measure within 90 days of its notification by the CCAMLR Secretariat, the Member is bound to give it effect. Failure to do so is a violation of the treaty obligation under the Convention.

Alternative D3: Issue permits annually in Division 58.5.2 by season and by limiting harvest to 1,173 mt (half the largest amount of annual international harvest during the period from 1993-2003).

One half of the maximum annual harvested during this period would be substantially more than the current catch limit for Division 58.5.2. However, this alternative does not contemplate issuing permits to harvest icefish in Division 58.5.2 at any level that would exceed the then current CCAMLR catch limit; to do so would be unlawful, as discussed above.

Alternative D4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

If the United States were the only nation fishing in this division, this alternative would result in zero catch. However, prohibiting U.S. catch would not ensure that the catch limit was not reached because other Members have historically harvested amounts approaching the catch limit.

E. Krill harvesting in Area 48 (Including Subareas 48.1, 48.2, 48.3 and 48.4) and Divisions 58.4.1 and 58.4.2).

Alternative E1: Issue permits annually in Area 48 and Divisions 58.4.1 and 58.4.2 by season and within the CCAMLR catch limits on vessels participating in the krill trawl fisheries (Status Quo; no-action alternative).

Catches by the krill trawl fisheries in all regions for each year during the last decade are provided in Table 1. Catch limits for the fisheries for each year during this period are provided in Table 2. Precautionary catch limits were set based upon fisheries independent (research surveys) data. The decision rules used to evaluate the GYM results ensure precautionary catch limits. Because the catch limits were calculated using fishery independent data and are precautionary in design, harvesting krill at or below the catch limits should not impact sustainable krill yield.

However, the regional impacts of krill harvest approaching the current limits may adversely impact populations of breeding predators who depend upon local krill populations for food. There has been considerable debate regarding the impacts on dependent predators if the krill fishery substantially increased harvest levels in inshore areas. This was recognized by CCAMLR CM 51-01 that prohibits the expansion of the krill harvest in Area 48 above 620,000 mt unless an allocation plan to small management units has been agreed upon and initiated. This is a subject of investigation by CCAMLR's Scientific Committee. The limit of 620,000 mt is approximately the sum of the historical (1980-early 1990s) maximum catch in each of Subareas 48.1, 48.2 and 48.3. There has been no harvesting in Division 58.4.2 and relative small catches in Division 58.4.1.

In the future, CCAMLR may consider setting catch limits for krill in other subareas or divisions. These limits would be set following the notification and review process for new and exploratory fisheries.

Alternative E2: Issue five-year permits in Area 48 and Divisions 58.4.1 and 58.4.2 by season and within the CCAMLR catch limits to U.S. vessels participating in the krill trawl fisheries (Status

Quo except for an extension to a five-year period).
(Preferred Alternative)

This alternative is the same as Alternative E1 (a status quo no action alternative) except that it will allow permits to be issued for a five-year period instead of annually. This alternative is based upon: (1) the very small annual and historical harvest of krill relative to the precautionary cap set by CCAMLR for krill; and (2) the projected continuing availability of krill even if the harvest of krill were to significantly increase. The CCAMLR Scientific Committee factored cumulative harvest and harvest history in 1991 in recommending an annual precautionary catch limit for krill of 4 million mt. It has continued to recommend a CCAMLR catch limit at this level each year since 1991. The catch limit is based on a harvest rate of 9.1%, which results in a 4 million ton limit for the aggregate of Subareas 48.1 (1.008 million mt), 48.2 (1.104 million mt), 48.3 (1.056 million mt) and 48.4 (0.832 million mt). Catches since 1992 have never exceeded the 1994/95 level of 134,420 mt. The total catch of all fishers participating in the krill fishery in Area 48 for the 2002/2003 season was 116,390 mt. This was 2.9% of the available CCAMLR catch limit for the Area. CCAMLR has set precautionary limits of 440,000 mt and 450,000 mt respectively in Divisions 58.4.1 and 58.4.2. The catch limit in 58.4.1 is further divided into smaller units as follows: 277,000 mt west of 115˚ E and 163,000 mt east of 115˚ E. There has been no reported fishing for krill in Area 58 since 1995. For environmental and logistical reasons, the krill fishery is likely to remain concentrated in the Southwest Atlantic sector of the Southern Ocean as opposed to expanding into the Pacific or Indian Ocean sectors. Because of the favorable fishing conditions in the Southwest Atlantic sector, as well as proximity to supplies, shelter, ports and potential markets, this region may be viewed as the center of krill fishing operation. Despite the rather restricted potential for spatial expansion, the krill fishery in the South Shetlands may be far from reaching its capacity.

Alternative E3: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Area 48 and Divisions 58.4.1 and 58.4.2 by season limiting harvest to twice the largest amount of international harvest during the preceding decade (i.e., 1993-2003).

The maximum catches in all Subareas of Area 48 and both Divisions are substantially lower than the current catch limits (Table 3). Harvest limits of twice the largest amount in the last decade would be sustainable and would not adversely affect krill populations in these areas. If harvests in each of the Subareas 48.1, 48.2 and 48.3 were doubled the total would be less than the present 620,000 mt limit, an amount that would require small scale allocation. For Division 58.4.1, a harvest of twice the historical maximum would be very small compared to the current catch limit.

Failure to meet an obligation would be a violation of Article IX of the CCAMLR, however, it does provide a mechanism for objecting to a Conservation Measure. If a Member has not objected to a measure within 90 days of its notification by the CCAMLR

Secretariat, the Member is bound to give it effect. Failure to do so is a violation of the treaty obligation under the Convention.

Alternative E4: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Area 48 and Divisions 58.4.1 and 58.4.2 by season limiting harvest to half the largest amount of international harvest during the preceding decade (i.e., 1993-2003).

One half of the maximum catch limit for krill harvested in the regions would be very small relative to the current catch limits (Table 3). In fact, it would be anticipated that for the near future, the total international harvest will be small compared to the current catch limits in the assessed regions.

Alternative E5: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

As discussed for Alternatives E2, E3 and E4, if the United States were the only nation fishing in these regions, this alternative would result in no fishing in the regions. However, the historical catch and the expected near-future catches are substantially less than the current catch limits.

EXPLORATORY FISHERIES:

F. Toothfish harvesting in Subareas 48.4, 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1

Alternative F1: Issue permits annually in Subareas 48.4 and 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the exploratory toothfish fisheries in these regions are either zero or less than one mt (Table 1). Because insufficient data are available to assess these fisheries, catch limits are small (Table 2). A precautionary approach was used to determine catch limits and it is anticipated these fisheries will not be allowed to expand in the absence of fishery independent data.

Alternative F2: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Subareas 48.4 and 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1 by season and by limiting harvest to twice the largest amount of international harvest during the preceding decade (i.e., 1993-2003).

Because catches in these regions are either zero or less than one mt (Table 1), allowing twice the historical maximum would have little or no effect on the populations.

Alternative F3: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Subareas 48.4 and 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1 by season limiting harvest to half the largest amount of international harvest during the preceding decade (i.e., 1993-2003).

Because catches in these regions are either zero or less than one mt (Table 1), restraining the catch to half these amounts would have little or no effect on the populations.

Alternative F4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

As discussed for other alternatives above, if the United States was the only nation fishing in these regions, this alternative would result in no fishing in the regions. However, it should be noted that prohibiting U.S. catch would not prevent some limited fishing from being developed in these exploratory regions by other member nations.

G. Toothfish harvesting in Subareas 88.1 and 88.2.

Alternative G1: Issue permits annually in Subareas 88.1 and 88.2 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fisheries (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the toothfish longline fisheries in both regions for each year during the last decade are provided in Table 1. Fishing began in Subarea 88.1 in the 1996/97 season and in Subarea 88.2 in the 2002/03 season. Catch limits for fisheries for each year are provided in Table 2. Catches have to date been substantially less than the catch limits. The fisheries are greatly influenced by ice cover in the regions. In some years, access to the fishing grounds is restricted most of the season. Although sufficient data for stock assessments are not available, investigations such as tagging efforts and feasibility of scientific trawl surveys are being investigated. NMFS does not expect that the current catch limits will be increased without sufficient scientific data to warrant the increase.

Alternative G2: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Subareas 88.1 and 88.2 by season and by limiting harvest to 3,662 mt and 212 mt, respectively (twice the largest amounts of annual international harvest during the period from 1993-2003).

The maximum catches in Subareas 88.1 and 88.2 since fishing began were 1,831 and 106 mt, both taken in the 2002/03 season, respectively (Table 3). The respectively catch limits for the current 2003/04 season are 3,250 and 375 mt. Allowing a harvest of twice the historical maximum catch in Subarea 88.1 would exceed the 2003/04 catch limit, however, this alternative does not contemplate issuing permits to harvest toothfish in Subarea 88.1 at any level that would exceed the then current CCAMLR catch limit; to do so would be unlawful.

Failure to meet an obligation would be a violation of Article IX of the CCAMLR, however, it does provide a mechanism for objecting to a Conservation Measure. If a Member has not objected to a measure within 90 days of its notification by the CCAMLR Secretariat, the Member is bound to give it effect. Failure to do so is a violation of the treaty obligation under the Convention.

Allowing twice the historical maximum in Subarea 88.2 would not exceed the current catch limit. It is believed that fishing conditions in this region will be severely constrained by harsh environmental condition (i.e., ice) and it is unlikely to be developed as a major fishery.

Alternative G3: Issue permits annually in Subareas 88.1 and 88.2 by season limiting harvest to 916 mt and 53 mt, respectively (half the largest amount of annual international harvest during the period 1993-2003).

For both regions, this would be substantially less than the current catch limits.

Alternative G4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

If the United States were the only nation fishing in these regions, this alternative would result in no fishing in the regions. However, prohibiting U.S. catch would not ensure that the fishery would cease. In the future, harvests by other Members may result in the catch limit being reached.

H. Crabs and Squid harvesting in Subarea 48.3, grenadiers and rattails (*Macrourus*) harvesting in Divisions 58.4.3a&b, and spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*) harvesting in Division 58.4.2.

Alternative H1: Issue permits annually in the above regions for the respective fisheries by season and within the CCAMLR catch limits (Status Quo; no-action alternative). **(Preferred Alternative)**

Catches by the above fisheries in their respective regions for each year during the last decade are provided in Table 1. Catch limits for the fisheries for each year during this period are provided in Table 2. Catches are either zero or very small relative to the catch limits. No member nations presently have an active fishery.

Alternative H2: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in the above regions for the respective fisheries by season and by limiting harvest to twice the largest amount of annual international harvest during the period 1993-2003.

Because catches have been either zero or very small in all fisheries (Table 3), allowing a harvest of twice the maximum catch would not approach the current catch limits for the fisheries. Based on difficulties in the marketing of the product and low economic viability, NMFS does not anticipate that a substantial fishery will develop for any of these species in any region in the foreseeable future.

Alternative H3: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in the above regions for the respective fisheries by season and by limiting harvest to half the largest amount of annual international harvest during the period 1993-2003.

One half the maximum catch limit for all the above fisheries would be very small (Table 3) and would not approach the current catch limits.

Alternative H4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

If the United States were the only nation fishing in these regions, this alternative would result in no harvesting. However, prohibiting U.S. catch would not ensure that the catch limit was not reached. None of these fisheries are currently being executed although catch limits are in place. Most of these are not considered viable fisheries. There have been attempts by U.S., UK, and Korean vessels to harvest crabs and/or squid but they have proved to be uneconomical.

FUTURE EXPLORATORY FISHERIES:

Alternative I1: Issue permits annually by season and within the CCAMLR catch limits after submission and review by the CCAMLR Scientific Committee of the Research and Fisheries Operations Plan required by CCAMLR Conservation Measure 21-02 (Status Quo; no action alternative). **(Preferred Alternative)**

Permits to fish in areas for species not previously or recently fished would only be issued following the designation of the fishery as an exploratory fishery by CCAMLR and by setting a catch limit pursuant to the notification and review process in Conservation Measure 21-02. The permit would limit catch to the level set by CCAMLR.

Alternative I2: Issue permits annually by season and within the CCAMLR catch limits without requiring the submission of a Research and Fisheries Operations Plan as required by CCAMLR Conservation Measure 21-02

Permits to fish in areas for species not previously or recently fished would be issued without regard to the notification and review process in Conservation Measure 21-02 or the catch limit set by CCAMLR.

Conservation Measure 21-02 addresses exploratory fisheries, which are those fisheries lacking sufficient data to conduct a stock assessment. CM 21-02 directs the CCAMLR SC to develop a Data Collection Plan for each exploratory fishery that identifies data needs and describes actions necessary to obtain the relevant data from the exploratory fishery. Member countries that participate in the exploratory fishery must submit a Research and Fishing Operations Plan for review by the SC and the Commission. The CCAMLR Convention stipulates that the expansion of a new fishery must not proceed faster than the acquisition of information necessary to ensure that the fishery can and will be conducted in accordance with the principles of Article II of the Convention.

Catch limits in exploratory fisheries are set based upon a comparison of the amount of fishable bottom habitat in the exploratory region with those in established fisheries and then recruitment rates, etc. from the established fisheries areas are used in the exploratory regions. To ensure that catch limits are precautionary, CCAMLR allows only a small proportion of the stocks to be taken. Each vessel participating in the exploratory fishery must carry a scientific observer to ensure that data are collected in accordance with the agreed Data Collection Plan, and to assist in collecting biological and other relevant data.

See Sec. 1.0 - Purpose and Need for Action for a discussion of NMFS conducting an independent review or analysis of any new future exploratory fishery to see that the issuance of a U.S. AMLR harvesting permit would be consistent with the three CCAMLR objectives. If NMFS concludes that issuance of the AMLR harvesting permit is consistent, there would be no additional NEPA analysis for the requested permit.

Bycatch of Finfish and Invertebrates.

There are a large number of species, families and orders listed by CCAMLR's Statistical Bulletin as having been caught either as bycatch to the fisheries listed above or by research cruises during at least one season during the last decade (Table 1, CCAMLR Statistical Bulletin). Very small amounts are reported for most species (less than one-half of a mt) and most have been taken in only one or two seasons.

CCAMLR has established bycatch limits for five species in Subarea 48.3 (CM-33-01) and four species groups, plus a limit for all other species, in Division 58.5.2 (CM 33-02). No directed fishery for any species can be developed without regulation by a CCAMLR conservation measure and expected bycatch levels in the foreseeable future will remain within existing limits.

Bycatch levels of bony fish, elasmobranches (skates and rays), and invertebrate taxa from longline and trawl fisheries for target species in the Southern Ocean are monitored, assessed and managed to the extent possible on an annual basis as part of the CCAMLR WG-FSA.

Information on removals of fish and invertebrate bycatch are compiled each year through fine scale data submission to the CCAMLR data center, scientific observer logbooks and reports, and STATLANT data. In addition to estimates of total removals and a measure of the direct impact of fishing operations on populations of fish and invertebrate bycatch, assessment and management of these species requires collection of information on biology, life history, abundance, and gear vulnerability. Research in support of these aspects is conducted annually by CCAMLR member countries.

The primary bycatch species for all fisheries are *rajids* (skates and rays) and *macrourids* (rattails). Other bycatch species of fish and invertebrates are encountered to a considerably lesser degree. Bycatch levels in both longline and trawl fisheries have been generally low; 1-2% or less as a percentage of total targeted catch weight for all *D. eleginoides* fisheries and 1-4% for *D. mawsoni* in Subarea 88.1.for *rajids* and *macrourids*, respectively. Bycatch of finfish and invertebrates in fisheries targeting krill and icefish is negligible to non-existent.

There is a range of mandatory measures that have been implemented to minimize impacts on non-target taxa. These measures include avoidance and mitigation approaches, and precautionary catch limits.

Avoidance and mitigation approaches include move-on rules designed to minimize local depletion, and gear restrictions. For example, in Division 58.5.2, if bycatch in any one haul of skates and rays, *Macrourus spp.*, *Channichthys rhinoceratus* or *Lepidonotothen squamifrons*, is equal to or greater than 2 mt, the fishing vessel must not fish using that method of fishing at any point within 5 nautical miles of the location where the bycatch was exceeded for a period of at least five days (CM 33-02). Gear restrictions include a prohibition of use of bottom trawls in Subarea 48.3 to minimize bycatch of benthic species, as well as a prohibition on bottom trawling at depths less than 550 meters in Division 58.5.2 to protect benthic species.

Precautionary catch limits for major bycatch species groups are currently established in Subarea 48.3 (CM 33-01), Division 58.5.2 (CM 33-02), and in all new and exploratory fisheries (CM 33-03). A formal stock assessment of one *macruorid* species, *Macrourus carinatus*, in Division 58.5.2 has been conducted. However, in the absence of quantitative assessments or where data on bycatch species are insufficient, catch limits are based on a percentage of the target catch or an arbitrary catch level that is considered to be sufficiently precautionary. For example, for the established fishery in Subarea 48.3, limits for bycatch species are set as a proportion (5%) of the toothfish catch. In new and exploratory fisheries, the bycatch limits for skates and rays are set as 5% of the catch limit of *Dissostichus spp.* or 50 mt whichever is greater. For *Macrourus spp.* the TAC is 16% of the catch limit for *Dissostichus spp.* or 20 mt, whichever is greater. For all other all other species combined the TAC is 20 mt.

Because there is no directed fishing for these species, no alternatives are discussed to allow harvesting under any level except as specified as bycatch limits.

II. ACTION: <u>Restrict longline fishing in CCAMLR Convention Area</u>.

Within the CCAMLR Convention Area, longlines are used to fish for toothfish. Conditions and restriction of the fishery in each region are specified by Conservation Measures. These include requirements to place in effect mitigation measures to reduce seabird mortality as discussed above.

Alternative J1: Issue permits annually to U.S. fishery to conduct longline operations in accordance with CCAMLR conservation measures in effect for each specific region (Status Quo; no-action alternative). **(Preferred Alternative)**

This alternative would require U.S. fishers to conduct operations in accordance with all CCAMLR requirements, including season, mitigation, observers, data reporting, and biological data collection.

Alternative J2: Prohibit all U.S. longline fishing in areas where levels of seabird or marine mammal incidental mortalities potentially may adversely affect their respective populations.

This alternative would prohibit U.S. longline fishing in CCAMLR regions where high levels of incidental mortality and/or entanglement of seabirds or marine mammals potentially may adversely affect their respective populations. Such levels would be based upon the advice provided by the CCAMLR Scientific Committee.

Alternative J3: Issue permits annually to U.S. fishery to conduct longline operations but limit number of seabird mortalities or marine mammal entanglements per vessel allowed in each CCAMLR area.

This alternative would set a maximum allowable catch of seabirds or marine mammals per vessel and CCAMLR area, based on the advice provided by the CCAMLR Scientific Committee. Compared to seabird bycatch in longline fisheries in Southern Ocean, pinniped bycatch is minimal to non-existent. The more direct impacts to pinnipeds from Southern Ocean longline fisheries are generally not through bycatch but through entanglement.

Entanglement in packing bands lost or discarded at sea has historically taken a much greater toll than bycatch (Kock 2001). An initial study conducted in 1988/89 suggested that several thousand Antarctic fur seals (5,000 - 15,000 seals depending on the baseline assumption) got entangled in plastic packing bands and net fragments every year, mainly originating from fishing vessels (Croxall et al., 1990; Staniland, 1998; Taylor, 1997, 1998; Taylor and Croxall, 1997). Trends in these entanglements over time have been reviewed by Arnould and Croxall (1995) and more recently by Aspey and Staniland (1999). In 1993 CCAMLR adopted Conservation Measure 63/XII in order to reduce the amount of plastic floating in the Southern Ocean. The Conservation Measure prohibited the use of plastic package bands to secure bait boxes from 1995/96 and for other purposes from 1996/97 onwards (CCAMLR, 1993). Since enacting this conservation measure fur seal entanglement at Bird Island (South Georgia) decreased by more than 80% (Aspey, 2000).

Alternative J4: Permit U.S. longline fishing in all areas without restriction.

This alternative would allow U.S. longline fishing without restrictions that would not be in accordance with CCAMLR Conservation Measures.

III. ACTION: Restrict trawl fishing in CCAMLR Convention Area.

No U.S. finfish fishery using trawl gear has occurred in the CCAMLR Convention Area; however, if a U.S. permit request were received, the United States would adopt regulations based upon CCAMLR Conservation Measures allowing trawl fishing. Use of trawl gear (bottom or pelagic) is allowed for fisheries for toothfish in Divisions 58.4.3a (CM 41-06), 58.4.3b (CM 41-07), 58.5.2 (CM 41-08); for krill in Area 48 (CM 51-01) and Divisions 58.4.1 (CM 51-02) and 58.4.2 (CM 51-03); for icefish in Subarea 48.3 (pelagic only) (CM 42-01) and Division 58.5.2 (CM 42-02); for *Macrourus* in Divisions 58.4.3a (CM 43-02) and 58.4.3b (CM 43-03); and for four finfish species in Division 58.4.2 (CM 43-04).

Krill are fished using pelagic trawls exclusively (see Sec. 3.2 of this DPEIS for specific mitigation measures to reduce bycatch of seals, i.e., use of seal excluder devices in krill trawls). One U.S. boat has and continues to harvest krill. The target depth of the hauls for the krill fishery is within the upper 50 meters. Krill range from the surface to around 4,000 m. Because these are midwater trawls, there is no interaction with the krill trawl and the bottom.

Alternative K1: Issue permits annually to U.S. fishery to conduct trawl operations in accordance with CCAMLR conservation measures in effect for each specific region (Status Quo; no-action alternative). **(Preferred Alternative)**

This alternative would require U.S. fishers to conduct operations in accordance with all CCAMLR requirements, including season, mitigation, observers, data reporting, and biological data collection.

Alternative K2: Prohibit all U.S. trawl fishing in areas where levels of seabird or marine mammal incidental mortalities potentially may adversely affect their respective populations.

This alternative would prohibit U.S. trawl fishing in CCAMLR regions where high levels of incidental mortality and/or entanglements of seabirds or marine mammals potentially may adversely affect their respective populations. Such levels would be based upon the advice of the CCAMLR Scientific Committee.

Alternative K3: Issue permits annually to U.S. fishery to conduct trawl operations but limit number of seabird mortalities or marine mammal entanglements per vessel allowed in each CCAMLR area.

This alternative would set a maximum allowable catch of seabirds or marine mammals per vessel and CCAMLR area, based on the advice provided by the CCAMLR Scientific Committee.

Alternative K4: Prohibit all U.S. bottom trawl fishing in all areas.

This alternative would prohibit U.S. bottom trawl fishing that is presently permitted except for Subarea 48.3 (CM 42-01).

Alternative K5: Permit U.S. trawl fishing in all areas without restriction.

This alternative would allow U.S. longline fishing without restrictions that would not be in accordance with CCAMLR Conservation Measures.

IV. ACTION: <u>Scope of permits required to "harvest" and "import" toothfish</u>.

Alternative L1: Require a NMFS-issued AMLR harvesting permit to fish for toothfish inside the CCAMLR Convention Area; require a NMFS-issued AMLR harvesting permit to fish for toothfish outside the CCAMLR Convention Area; and require a DCD on all shipments of toothfish wherever harvested (Status Quo; no-action alternative).

Alternative L2: Require a NMFS-issued AMLR harvesting permit to fish for toothfish inside the CCAMLR Convention Area and require a DCD for toothfish harvested inside the CCAMLR Convention Area.

Alternative L3: Require a NMFS-issued AMLR harvesting permit to fish for toothfish inside the CCAMLR Convention Area and require a DCD on all shipments of toothfish wherever harvested. **(Preferred Alternative)**

During its 1999 annual meeting, CCAMLR adopted a Catch Documentation Scheme (CDS) for toothfish. The CDS was adopted to track and monitor trade in *Dissostichus* species (Patagonian and Antarctic toothfish) as a means of combating illegal, unregulated and unreported catches of toothfish. The CDS requires that all shipments of toothfish, wherever harvested and by whomever harvested, imported into any CCAMLR Contracting Party (including the United States), be accompanied by a Dissostichus Catch Document (DCD). NMFS promulgated regulations in 2001 implementing the CDS. The regulations, in part, amended the definition of "Antarctic marine living resources" (AMLR) to include "All species of *Dissostichus* wherever found," i.e., whether harvested inside or outside the CCAMLR Convention Area. It was not intended by this amendment to the definition of AMLR to require that owners of U.S. vessels fishing for toothfish on the high seas outside the CCAMLR Convention Area apply for the AMLR harvesting permit required by 50 CFR 300.112. A harvesting permit for AMLR is required for AMLR as defined by AMLRCA. AMLRCA defines AMLR as the "population of finfish, mollusc, crustaceans and all other species of living organisms, including birds, found south of the Antarctic Convergence" (i.e., within the CCAMLR Convention Area). U.S. vessels fishing on the high seas are required by 50 CFR 300.13 to apply for a permit under the High Seas Fishing Compliance Act (HSFCA) (16 USC 5501 et seq.).

Alternative 1 would, inconsistent with the AMLRCA definition of AMLR, continue to require AMLR harvesting permits to fish for toothfish outside the CCAMLR Convention Area. While there are some populations of toothfish found outside the CCAMLR Convention Area, they are not AMLR as defined by AMLRCA, and thus, legislatively, do not require an AMLR harvesting permit. Alternative 1 would, however, continue to require a DCD on all shipments of toothfish entering the United States, regardless of whether those toothfish were harvested inside the Convention Area (AMLR toothfish) or outside the Convention Area (high seas toothfish).

Alternative 2 would require AMLR harvesting permits only for toothfish harvested within the CCAMLR Convention Area and would, although the CDS requires DCDs for toothfish wherever harvested, require DCDs only for toothfish harvested inside the Convention Area.

Alternative 3 would amend NMFS regulations to return the definition of AMLR to the AMLRCA definition and, as a consequence, no longer require an AMLR harvesting permit to fish for toothfish outside the Convention Area. Alternative 3, however, would preserve the requirement that all imports of toothfish, wherever harvested and by whomever harvested, be accompanied by a DCD. It would also continue the requirement that all U.S. vessels harvesting toothfish apply, complete and transmit DCDs as required by NMFS regulations implementing the CDS. This requirement would apply to toothfish harvested from inside the Convention Area pursuant to an AMLR harvesting permit and to toothfish harvested on the high seas pursuant to a HSFCA permit.

2.2 Trade Controls

I. ACTION: Import/re-export control program for AMLR.

These alternatives are designed to tighten or otherwise improve the import/re-export control program that the United States maintains for AMLR. Implementation of Alternatives 2-6 and 8 would reduce the possibility that IUU toothfish are imported into the United States and thereby increase protection to toothfish and to other species (seabirds and possibly killer whales and sperm whales) that may be adversely impacted by IUU longline operations for toothfish. The United States is one of the top two importers of toothfish in the world and the proposed alternatives would likely reduce the incentive for IUU fishing, as the United States would be able to prevent most importation of IUU fish coming into the United States. Alternative 7 would facilitate smoother operation of the pre-approval process, and Alternative 9 would support conservation efforts for toothfish populations not at significant levels in certain FAO Statistical Areas.

Alternative 1: Existing Catch Documentation Scheme and Existing Pre-approval of DCD (Status Quo; no-action alternative).

This alternative would continue the use of existing regulations for implementing the CDS (under 50 CFR Part 300, Subpart G). The pre-approval system will remain as is. This would not address the problem of dealers importing shipments of fresh toothfish in excess of 2,000 kgs who currently face the requirement of submitting a pre-approval application along with a complete and valid DCD 15 days prior to the arrival of the shipment (this problem is dealt with separately in ACTION II of this Sec. 2.2).

Alternative 1 would also prevent NMFS from addressing another problem faced by dealers under the current requirements; i.e., the requirement for submission of the U.S. Customs 7501 (entry) number at the time of application. According to U.S. Customs, this number cannot be issued 15 days prior to the arrival of a shipment that is the current requirement for submission of the pre-approval (including the U.S. Customs 7501 number). This requirement leaves dealers non-compliant with regard to the 15-day requirement for submission of the pre-approval.

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Alternative 1 would prevent NMFS from placing further restrictions on shipments entering the United States whose catch was harvested using longline vessels. Such restrictions could include the Centralized Vessel Monitoring Systems (C-VMS) and Electronic Catch Documentation (E-CDS) recently initiated by the CCAMLR Secretariat.

While Alternative 1, the status quo, would continue to discourage IUU fishing for toothfish or overfishing of toothfish in general, it would not be as effective as further restrictions utilizing tools such as the Electronic CDS and Centralized VMS created by CCAMLR explicitly for this purpose.

Alternative 2: No longer accept DCDs issued by CCAMLR member countries not fully participating in the E-CDS project once implemented by NMFS.

During the 2003 intersessional period (May through Sept. 2003) seven CCAMLR member states were invited to participate in a pilot study of the proposed E-CDS. The Commission believed that the limited period of the trial was not sufficient to recommend a full-scale implementation of the system. During its Fall 2003 meeting, the Commission agreed to extend the period of the trial to the 2004 intersessional period and involve all those parties wishing to participate. During the Fall 2004 meeting of the Commission, the United States indicated to the Members of the Commission that it planned to propose regulations that would exclude all catch documents for *Dissostichus* (DCDs) that were not generated through the E-CDS. The U.S. decision was based on: (1) the fact that the E-CDS is much more secure and reliable than the paper-based system; and (2) the assurance E-CDS gives with respect to adherence to CDS procedure and protocol given effect through Conservation Measure 10-05. With regard to fraud, the system is more secure in that only CDS officers are authorized to access the password protected secure sight. The password each officer has been issued denotes which parts of the system they are allowed to view and/or use. The system is much more reliable in that using paper document fields may be incorrectly completed, or even fraudulently completed while the electronic version has logic checks and will not allow the completion of a document with errors with regard to fraud. The U.S. announcement was made to encourage countries who were interested in continuing toothfish trade with the United States to participate in the use of E-CDS. The United States has had great success during the past year with the E-CDS system in trade with New Zealand, South Africa, and Australia. However, problems, e.g., incomplete or fraudulent documents, with countries that continue to use the paper-based system still frequently occur, as well as member countries that generate paper documents and then simply fail to submit them to CCAMLR. The Secretariat informed the United States (the largest global market for toothfish) that Japan (the second largest global market for toothfish) is utilizing the E-CDS and encouraging those who wish to access their markets to participate as well.

This alternative would greatly facilitate the trade of toothfish on behalf of U.S. dealers. The dealers would no longer be required to obtain and submit a DCD with the required pre-approval documentation. They would only be required to supply NMFS with identifying information, allowing the NMFS CDS officer to access the documents online through a password protected web-based system. Dealers would receive approvals much sooner than when paper-based documents must be researched.

As of July 2004, 56 electronic documents had been generated with respect to landings of toothfish. Flag States participating in the pilot electronic system include Australia, Chile, Spain, France, New Zealand, South Africa, United Kingdom and the United States. Of these only Australia, New Zealand, South Africa and the United States use it regularly. Both Japan and the United States, the two largest global importing countries use the electronic system.

Over the past year, of the dealers submitting electronic DCD information in conjunction with their pre-approval applications, all but one received approval the very same week that the application was submitted. The one exception to this was delayed for other reasons.

Because of this expeditious process, U.S. dealers have expressed their preference for buying fish with electronic documents. This gives them an added sense of security that the product they are buying has been legitimately harvested and legitimately documented following the protocol developed through CCAMLR. The other factor lending to their expressed preference is the expedited manner in which they receive approval for the shipment to enter commerce, avoiding expensive demurrage charges (charges assessed to containers that are still occupying space in the port after a designated time frame) that accrue during the approval process, and making trade much smoother between participating countries.

Alternative 3: No longer accept DCDs issued by any country not fully participating in the E-CDS project once implemented by the Commission.

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This would be the same text as Alternative 2 but would also include Non-Contracting Party countries participating in the CDS in addition to member States. There are very few, if any, Non-Contracting parties that are major fishers of toothfish. The role that most Non-Contracting Parties play in the CDS is that of landing, export, import or re-exporting states.

Alternative 4: No longer accept DCDs issued by CCAMLR member countries not participating in Centralized VMS (C-VMS), once implemented by the Commission.

During its Fall 2003 meeting, the Commission considered the advice of its Subcommittee on Inspection and Compliance regarding the development and adoption of a Centralized Vessel Monitoring System (C-VMS). The system would be operated through the CCAMLR Secretariat and would accommodate all vessels fishing for toothfish whether inside the Convention area or outside the Convention area. VMS units would be operated according to the specifications described in CM 10-04. As stipulated in CM 10-04, the VMS signal would be transmitted every 4 hours directly to the CCAMLR Secretariat and concurrently to the Flag State of the vessel. This would essentially centralize all location signals through the Secretariat so as to exclude any possibility of “dry labbing” data (i.e., falsifying or substituting position data). While the Commission failed to adopt a proposal to require C-VMS of all Members of the Commission who have vessels operating in the toothfish fishery, either inside or outside the Convention area, the proposal solicited overwhelming support by almost all Members. Because of this general support by the majority of the Members, the Commission agreed to support a trial C-VMS that would be established by the Secretariat and open to all interested parties who wished to participate. During the meeting, the United States noted that once the system was implemented, it would not accept DCDs for toothfish harvested by any vessel choosing not to participate in the C-VMS. Accepting only imports of toothfish harvested by vessels tracked through C-VMS and conveying paper-based DCDs would, in NMFS' view, be taking advantage of all the "validation tools" (i.e., E-CDS and C-VMS) offered to Members by the Commission and would provide the highest level of assurance with regard to shipments requesting import to the U.S. market.

During its Fall 2004 meeting, the Commission adopted a proposal to revise and implement the trial C-VMS. As adopted, a vessel's VMS must automatically communicate at least every four hours to a land-based fisheries monitoring center of its Flag State, and within time limits, to the CCAMLR Secretariat. The Secretariat will place the locational data on a password-protected website. The United States informed the Commission that, even though the four-hour reporting requirement applies only within the CCAMLR Convention Area, NMFS will continue to require port-to-port reporting every four hours for any toothfish shipments imported into the United States.

Alternative 5: No longer accept DCDs issued by any country not participating in Centralized VMS, once implemented by the Commission.

This would be the same text as Alternative 4 but would be extended to Non-Contracting Party CDS participants as well as member States of the Commission.

Alternative 6: Will only accept DCDs that have been validated by officials of the port State government where the toothfish was landed, exported, and/or re-exported where the port State government is a CDS participant.

This alternative stems from the several problems that the United States has experienced regarding the misinterpretation of Conservation Measure 10-05 that explicitly details how a DCD is to be completed. These misinterpretations include confusion over the requirement for a country to sign a landing, export or re-export government authority section for activity occurring within a free trade zone. In particular, Chile decided that fish being landed by Falkland Island vessels from their free trade zone was an exemption to this requirement. Under Chile's customs laws, activities such as landings within this "zone" are not considered to have entered into the customs territory of Chile and therefore they interpreted the responsibility of certifying the landing as the responsibility of the flag state. Specific language was developed and adopted by the Commission in 2003 which states "in the case of a landing, the master or authorized representatives shall confirm the landing by obtaining a signed and stamped certification on the Dissostichus catch document by a responsible official of the Port State of landing or free trade zone who is acting under the direction of either the customs or fisheries authority of the Port State and is competent with regard to the validation of Dissostichus catch documents." Conservation Measure 10-05 also requires that "For each shipment of *Dissostichus spp.*to be exported from the country of landing, the exporter shall adhere to the following procedures to obtain the necessary export validation of the Dissostichus catch document(s) that account for all the *Dissostichus spp.* contained in the shipment." It goes on to state that "(iv) the exporter shall obtain a signed and stamped validation of the Dissostichus catch document by a responsible official of the exporting State."

The other problem which gave rise to this alternative is the problem of having Flag States authorizing landings, exports and re-exports in ports other than their own where the government officials of the port state are fully capable of authorizing these actions under CDS. Over the past four years some member countries have routinely flown their own port officials to other ports, in other countries that are CDS participants to authorize landings, exports and re-exports whereby authorizing catch for their own vessels. The United States proposed the changes, as stated above, to the Conservation Measure that would clarify certification procedures for landings, exports and re-exports that were adopted by the Commission. However, even after this clarification was adopted and all Members agreed to abide by it, the United States has continued to be confronted with request for approval of documents which reflect that these protocols were ignored. Member states continued to have their own official travel to ports to authorize landing, exports or re-exports in ports that were participants in CDS. This action usurps the landing states port officials right and responsibility to oversee and certify landings of toothfish within their own ports or free trade zones. Therefore, in order to strengthen the decision taken at CCAMLR, NMFS believes that this alternative may provide support to deny entry to those shipments accompanied by documents that did not follow the protocol outlined in Conservation Measure 10-05.

Alternative 7: Allow importers to submit 7501 Customs information after having submitted an application for pre-approval but within the 15 day overall pre-approval period.

Under the current regulations as part of the application for pre-approval, each application must be accompanied by the U.S. Customs entry number, or sometimes referred to as the 7501 number. Although no concern was raised during the comment period of the proposed rule that contained this requirement, NMFS has since learned from dealers and brokers that this number cannot be issued until all invoices, bills of lading and other required entry paperwork are collected by the broker. Therefore, it is difficult and sometimes impossible for dealers to obtain this entry number at the time of application for approval. For this reason, an alternative to this requirement should be considered. The alternative offered here is that the 7501, or entry number could be supplied in a second stage of application closer to the time of import. In order to ensure that NMFS has appropriate time to process the application, all other required information should be submitted at the current 15 working days in advance of the arrival of the shipment. The 7501 entry number could then be submitted 3 working days prior to the shipment's arrival.

Alternative 8: Prohibit importation of toothfish landed at a port other than a port of a CCAMLR Contracting Party.

At the twenty second CCAMLR Commission meeting in 2003, concern was raised as to the practice of toothfish harvesting vessels landing catch in ports other than those of CCAMLR Contracting Parties. Resolution 15/XXII was drafted urging Contracting Parties to require as a condition of their license that the vessel should land catches only in States that are fully implementing the CDS. Since that time, it has come to the attention of the United States that no Non-Contacting party is fully implementing the CDS. Non-Contracting parties that have notified the CCAMLR Secretariat that they are participating have all placed some limitation on that participation and are therefore not "fully" participating. Non-Contracting Parties have also similarly been inconsistent with their participation making it impossible for Flag States to gauge whether they are able to allow their vessels to land in Non-Contracting party ports. This has caused severe problems with importers requesting approval for entry into U.S. commerce by making it difficult to verify that CDS protocol was followed. Some examples of this non-participation include refusing to certify landings but allowing the flag states authorities to fly in to certify in a port other than their own, participating coutries refusing to assign a government agency the responsibility of CDS, and allowing industry to authorize DCDs. These various levels of non-participation have resulted in infractions to related CDS rules therefore, making some imports ineligible for import approval. This causes harm to both legal fishers, and U.S. importers in that NMFS may, and has, denied entry to shipments whose fish were believed to have been harvested legally but was documented outside the CDS protocols adopted by all Members. With this alternative in place, this would no longer be an issue if the opportunity for this lack of adherence to the CDS protocol were eliminated.

Alternative 9: No longer accept imports of toothfish harvested in FAO Statistical Areas once the CCAMLR Scientific Committee has confirmed that toothfish are not at significant population levels (i.e., where the SC has concluded that fishable populations do not exist) in those areas.

The CCAMLR Scientific Committee (SC) and it's WG-FSA annually review catches reported as harvested within and outside the Convention Area, including from FAO Areas 41, 47, 51, 57, and 87. In recent years, the amounts of toothfish being reported as high seas catches are vastly more than previously reported. In addition to this general concern over catches being reported from high seas areas, in 2003, the SC noted that there had been an increase over the last three years for high seas catches reported from FAO Area 47 while the catches from Areas 51 and 57 were lower in 2002/03 than previously reported in the 2001/02 fishing season. The United States views this as a direct result of the ban it placed on all toothfish imports harvested from FAO Areas 51 and 57. In its October 22, 2002 published proposed rule for AMLR, NMFS showed that based on the best available information from the SC of CCAMLR, stock assessments could not confirm the presence of toothfish at the population levels that would support the harvesting that was being reported for those areas. NMFS also stated in that proposed rule that NMFS may propose extending the ban to other high seas areas. This extended ban would exclude catches taken in EEZs that are located within these statistical areas. Such catches include, but are not limited to, the artesianal fishery in South America in FAO 87, the South African EEZ fishery in FAO 51 and the Argentine EEZ fishery in FAO Area 41. These EEZ fishing areas can be distinguished from high seas areas on the catch documents and therefore would be allowed entry into the U.S. market.

The 2003 SC concluded by saying that some of the catches reported via the CDS may represent IUU catches from the Convention area, misreported as coming from high seas outside the Convention Area. Given this level of scrutiny applied to all high seas catches, the SC continues to work towards an assessment as to whether considerable commercial stocks exist in these areas. If the SC is able to confirm the non-existence of fishing concentrations and commercial-scale aggregations of Patagonian toothfish at levels that would support past catch reports, this alternative would allow for prohibition of imports from any or all of these fishing areas.

Alternative 10: Implement Alternatives 3, 5, 7, 8, and 9. **(Preferred Alternative)**

NMFS believes that Alternatives 3, 5, 8 and 9 would tighten import controls and are the most effective options to reinforce the current Toothfish Import Control Program. NMFS also believes Alternative 7 would give all dealers the opportunity to be in full compliance of the pre-approval system. The current requirement makes it impossible for dealers to comply with the 15-day advance application process. While each of these initiatives strengthen the trade controls and reduce the likelihood of IUU caught toothfish from entering the United States, a combination of Alternatives 3, 5, and 7 through 9 would provide a stronger set of controls so **Alternative 10 implementing these five alternatives is the preferred alternative**.

II. ACTION: Pre-approval for imports of fresh toothfish.

This action adressess the problem of dealers importing shipments of fresh toothfish in excess of 2,000 kgs (see next paragraph for definition of fresh toothfish) who currently face the requirement of submitting a pre-approval application along with a complete and valid DCD 15 days prior to the arrival of the shipment. These fresh, air-shipped toothfish shipments, require that the time between the completion of the catch document and the movement of the fish occur in less than 48 hours. This requirement makes it impossible for a dealer to comply with the 15-day advance application process.

As used in this DPEIS, “fresh toothfish” refers to any fresh whole/eviscerated Patagonian toothfish (*D. eleginoides)* that is imported via air shippment and is correctly designated as 0302694097 in the Harmonized Tariff Schedule of the United States Annotated (HTS). This does not include fish that has been previously frozen. Essentially there are no imports of fresh Antarctic toothfish (*D. mawsoni)* into the United States because it is caught in high latitude waters and the product is frozen onboard the vessels. Whereas *D. eleginoides* is primarily harvested by nearshore fisheries and air shipped as fresh fish to the United States.

Alternative 1: Shipments of fresh toothfish weighing less than 2,000 kg are exempt from pre-approval of DCD requirement (Status Quo; no-action alternative).

Note: 96% of the shipments are less than 2,000 kg.

Alternative 1 would maintain the fee requirement for dealers importing relatively small amounts of fresh fish per shipment. Dealers importing 2,000 kgs or more of fresh toothfish would pay the same fee of $200 as the dealer importing an average size container of 25,000 kgs of frozen toothfish under the current pre-approval system. This financially penalizes the dealer importing fresh product because they import numerous smaller shipments with a $200 fee for each while frozen product dealers typically import less frequently and only pay the $200 fee for their larger shipments. This cost is further passed on to the consumers.

In addition, the fresh product, most of which comes exclusively comes from Chile, is the part of the toothfish trade in which NMFS has the most confidence due to our bilateral working arrangement with Chile. That confidence stems from a bilateral arrangement that allows NMFS to receive a download of data describing all exporting documents for fresh product leaving Chile twice per month. Chile is also extremely responsive when NMFS has a separate query and typically responds within one business day. This enables NMFS to verify the documents on an almost real time basis.

Alternative 2: Also exempt shipments of fresh toothfish weighing more than 2,000 kg from pre-approval of DCD requirement. **(Preferred Alternative)**

This alternative would alleviate fresh product dealers from the two problems described in Alternative 1 of this section. The first being that the dealer would no longer be required to comply with a 15 day advance submission of the DCD prior to obtaining an approval. This is something that is impossible to do under the current system as the DCD document for fresh fish is issued the same day that the fish leaves the country, typically by air. Under this alternative, dealers importing fresh product would be required to submit the DCD along with the report of the entry on an approval form within 24 hours of the shipment clearing U.S. Customs. The second being that the dealers importing fresh product would no longer be charged a $200 fee for each and every shipment of toothfish being imported.

One of the concerns, expressed by NOAA enforcement, in relaxing this regulation is that if there is a concern about the legality of the fish and it has already been released and consumed prior to any enforcement action, then NMFS has no way to penalize the dealers. NMFS agrees that seizure and forfeiture of the fish would no longer be an option once the fish is released for consumption, but maintains that the ability to issue civil penalties under AMLRCA and the Lacey Act Amendments of 1981 (a statute which contains effective measures for addressing trafficking in illegal wildlife) should be sufficient to provide an adequate enforcement response to such violations. Both of these statutes have a five-year statute of limitations on prosecutions. NOAA/NMFS currently has the option of responding to violations with civil penalties issued by the NOAA Office of General Counsel for Enforcement and Litigation (GCEL), or with its Summary Settlement Program – a civil penalty program that allows enforcement agents to issue civil penalties in the field in *lieu* of the more formal GCEL process. Notably, at the next opportunity to amend AMLRCA, NOAA/NMFS will seek to increase the maximum civil penalty allowed under AMLRCA to ensure that the NOAA/NMFS's penalty options will be sufficient to address all violations. NOAA currently publishes the recommended penalties for AMLRCA violations in the AMLRCA Civil Administrative Penalty Schedule at www.gcel.noaa.gov. **Alternative 2 is the preferred alternative.**

2.3 Research Controls

I. ACTION: Revise the U.S. permit system for research within CCAMLR Ecosystem Monitoring Program (CEMP) sites.

CCAMLR established a system of sites contributing data to the CCAMLR Ecosystem Monitoring Program (CEMP) and agreed that studies being undertaken at CEMP sites may be vulnerable to accidental or willful interference and that protection should be afforded to the sites. It also agreed that it was not the purpose of the protection accorded to CEMP sites to restrict fishing activity in adjacent waters. Two CEMP sites are now afforded protection: Seal Islands, South Shetland Islands (CCAMLR Conservation Measure 91-03) and Cape Shirreff and the San Telmo Islands, Livingston Island, South Shetland Islands (Conservation Measure 91-01). Sites are established and reviewed every five years based upon an agreed management plan. Both sites will be reviewed in 2005. Because no CCAMLR CEMP data has been collected at the Seal Islands site since 1993/94 and because it is expected that no CEMP data will be collected from the site in the foreseeable future, CCAMLR will likely terminate the CEMP Site at Seal Islands after its review in 2005.

The Cape Shirreff site has also been afforded protection as a Site of Special Scientific Interest (SSSI No. 32). Sites of Special Interest are being revised as Antarctic

Specially Protected Areas (ASPA 149) under the Committee for Environmental Protection (CEP) of the Antarctic Treaty System.

Chile and the United States currently operate summer field camps located at Cape Shirreff and will likely continue to do so in the near future.

CEMP Site management plans must contain geographical information, maps, biological features, CEMP studies, statement of prohibited activities, prohibitions regarding access to and movement within or over the site, prohibitions regarding structures and disposal of waste and communications information. Management plans for both sites are attached to the respective CCAMLR Conservation Measures.

Alternative 1: Issue permits for U.S. researchers to conduct CEMP research at Seal Island and Cape Shirreff (if Seal Islands is retained as a CEMP site by CCAMLR) based upon CCAMLR approved Management Plans set forth in Conservation Measures 91-03 and 91-01, respectively, that provides information on prohibited activities, access, movement, structures and waste disposal. Permits are currently issued for a five-year period. (Status Quo; no-action alternative). **(Preferred Alternative)**

The U.S. Seal Islands research facility was closed in 1995 due to the unstable condition of the rock faces on the island. Thus, for Seal Islands, there will be no further U.S. research on the site and no requests for a NMFS-issued CEMP permit. U.S. researchers have current permits to conduct research at Cape Shirreff. Conditions of the permit include restrictions on activities to prevent damage, interference with, or adversely affecting CEMP monitoring and directed research; prohibition in occupation of the site during the period 1 June to 31 August; prohibition in entering pannier or seabird colonies except for research purposes; restricted aircraft over flight, use of land vehicles, and pedestrian movement; construction of new structures by permit only; and prohibition of waste disposal and open burning.

Alternative 2: Issue permits for U.S. researchers to conduct CEMP research at Seal Islands and Cape Shirreff (if Seal Islands is retained as a CEMP site by CCAMLR) with more severe restrictions than set forth by CCAMLR Conservation Measures 91-03 and 91-01, respectively.

Because many of the conditions for protection of CEMP sites are to prohibit activities, more severe restrictions would not be possible. However, permitting more severe restrictions such as activities associated with research activities or prohibiting entry into research areas would adversely affect research activities and prohibit investigations needed to accomplish CCAMLR management.

Alternative 3: Issue permits for U.S. researchers to conduct CEMP research at Seal Islands and Cape Shirreff (if Seal Islands is retained as a CEMP site by CCAMLR) based upon lesser restrictions than set forth by CCAMLR Conservation Measures 91-03 and 91-01, respectively.

Permitting activities currently restricted or prohibited would be in violation of CCAMLR conservation measures. However, this alternative does not contemplate issuing permits to conduct CEMP research at any level that would exceed the then current CCAMLR Conservation Measures; to do so would be unlawful.

II. ACTION: <u>Enhance collection of scientific data and research through the use of scientific observers, and develop regulations to support implementation of an observer program</u>.

CCAMLR adopted a Scheme of International Scientific Observation in 1992 at its eleventh annual meeting (see CCAMLR Basic Documents Part 10 at www.CCAMLR.org). Observers placed on board fishing vessels pursuant to the scheme observe and report on the operations of fishing activities and the effects of fishing on target and associated species of living marine resources. Observers undertake tasks and record their observations pursuant to protocols and using formats approved by the CCAMLR SC. These tasks include recording details of vessel operation; taking catch samples; recording biological data by species caught; recording bycatch; recording entanglement and incidental mortality of birds and mammals; recording procedures by which declared catch weight is measured; collecting and reporting factual data on sightings of fishing vessels in the Convention Area, including vessel type identification, position and activity; and collecting information on lost fishing gear and garbage disposal by fishing vessels at sea.

CCAMLR has identified two types of scientific observers who may collect the information required in CCAMLR managed fisheries. These are: (1) nationals of the Member designating them, who operate on board a fishing vessel of that Member and conduct themselves in accordance with the customs and order existing on the vessel; and (2) observers operating in accordance with bilateral arrangements between a Member whose vessel is fishing (the Receiving Member) and a Member providing the observer (the Designating Member). The CCAMLR scheme identifies the elements, which must be included in a bilateral arrangement. The U.S. Department of State negotiates bilateral arrangements placing U.S. nationals as observers on non-U.S. Member vessels and receiving non-U.S. Member nationals as observers on U.S. vessels.

CCAMLR conservation measures require all fishing vessels operating in the Convention Area (except for vessels fishing for krill) to carry on board, throughout all fishing activities within the fishing period, at least one scientific observer placed pursuant to a bilateral arrangement and, where possible, one additional scientific observer. In

Subareas 88.1, 88.2 and 48.6 and Divisions 58.4.1 and 58.4.2, where exemptions are allowed for setting longlines during daylight hours, two observers are required, one of which must be placed pursuant to a bilateral arrangement.

NMFS has not published regulations implementing the details of the CCAMLR Scheme of International Scientific Observation. NMFS has, by Federal Register notice, implemented the annual conservation and management measures adopted by CCAMLR (including requirements in these measures for scientific observers) for Convention Area fisheries. Additionally, NMFS requires, as a condition of each vessel's AMLR harvesting permit, that the vessel, including vessels fishing for krill, carry scientific observers on board in the Convention Area, throughout all fishing activities within the fishing period. Several of the observers have been placed pursuant to bilateral arrangements negotiated by the Department of State with Japan, South Africa and Ukraine. The other observers have been U.S. nationals. NMFS coordinates with the vessel permit holders and observers in all instances to assure that observers are fully versed in their duties in recording the observations required by CCAMLR.

The following alternatives describe possibilities for implementing the CCAMLR Scheme of International Scientific Observation.

Alternative 1: Require scientific observers on all U.S. vessels fishing in the CCAMLR Convention Area pursuant to CCAMLR's annual conservation and management measures requiring scientific observers and as a condition of a vessel's AMLR harvesting permit. (Status Quo; no-action alternative).

NMFS has, by Federal Register notice, implemented the annual conservation and management measures adopted by CCAMLR (including requirements in these measures for scientific observers) for Convention Area fisheries. Vessels fishing in exploratory fisheries for crab, squid and toothfish are required by annual CCAMLR conservation measures to carry one scientific observer pursuant to a bilateral arrangement and, where possible, one additional scientific observer. In the case of certain of the exploratory toothfish fisheries, the vessel must carry at least two observers, one of whom must be placed pursuant to a bilateral arrangement. NMFS regulations, however, only require that each vessel participating in an exploratory fishery carry one scientific observer (see 50CFR 300.106 (c)). Vessels fishing for finfish in an established fishery are required to have at least one scientific observer, and may include one carried pursuant to a bilateral arrangement. CCAMLR measures do not, at present, require the placement of scientific observers on vessels fishing for krill. NMFS, however, requires, as a condition of each vessel's AMLR harvesting permit, that all vessels, including vessels fishing for krill, carry scientific observers on board in the Convention Area, throughout all fishing activities within the fishing period. Where CCAMLR requires a scientific observer designated pursuant to a bilateral arrangement, Department of State negotiates the arrangement and NMFS coordinates with the vessel captain and the observer.

Alternative 2: Amend NMFS regulations to clarify the requirement that all U.S. vessels fishing in the CCAMLR Convention Area, including vessels fishing for krill, or vessels conducting longline testing trials outside the Convention Area prior to longline fishing within the Convention Area, must carry one or more national scientific observer or scientific observer placed pursuant to a bilateral arrangement.

The status quo requires that U.S. vessels carry scientific observers as called for in CCAMLR conservation and management measures. This alternative would require NMFS to amend its regulations to state that all U.S. vessels fishing in the Convention Area, including vessels fishing for krill, or vessels conducting longline testing outside the Convention Area prior to longline fishing within the Convention Area, carry one or more scientific observers as required by CCAMLR conservation and management measures. It would amend 50 CFR 300.106 (c) which indicates that only one scientific observer is required in all exploratory fisheries when, in fact, two are required in some exploratory fisheries.

Alternative 3: Amend NMFS regulatons to include the terms of the CCAMLR Scheme of International Scientific Observation on bilateral arrangements for placement of observers.

The status quo requires that U.S. vessels carry scientific observers as called for in CCAMLR conservation and management measures. It does not incorporate the standards agreed by CCAMLR in the Scheme of International Scientific Observation for the placement of observers pursuant to a bilateral arrangement in NMFS regulations. These standards address: status of the observer while on board a vessel; accommodations; meals; access to data and vessel operations; security and welfare of observers; medical care; communications to and from observers; transportation of and boarding by observers; insurance; equipment; clothing and salary. Department of State negotiates the specifics of these elements in concluding bilateral arrangements.

NMFS regulations are also not specific as to the standards for the placement of national scientific observers. Regulations under this alternative could include: notification requirements to NMFS; duties of observers; duties of the vessel master/crew; observer accommodation and meals; and observer safety. Specific regulations could address; the proper amount of notification to the observer that fishing has commenced; a detailed list of duties (e.g., access to records, electronics and work areas) that the master, crew and observer are expected to comply with to ensure that neither the observer's work nor the operations of the vessel are interfered with; requirements that ensure that observers will have adequate accommodation and meal at sea; requirements for observer qualifications and authorization; and requirements to ensure the safety of the observer at sea (e.g., transfer at sea procedures, prohibitions on harassment, interference and assault).

Alternative 4: Implement Alternatives 2 and 3. (**Preferred Alternative**)

NMFS believes that Alternatives 2 and 3 together are the most effective options to clarify and strengthen the scientific observer program and thereby enhance data collections and observations.

2.4 Enforcement Controls

The following alternatives explore different possibilities for the implementation of a vessel monitoring system (VMS) on U.S. flagged vessels fishing for AMLR in the Convention Area. VMS is mandated for contracting parties under CCAMLR Conservation Measure 10-04. However, the alternatives here deal with the regulatory structure for implementation of a VMS, which is a matter left up to the Flag State.

I. ACTION: Enhance enforcement capability through use of Vessel Monitoring System (VMS) with additional regulations to support implementation of the VMS.

As defined by CCAMLR Conservation Measure 10-04, a VMS is a system established by participating flag nations whereby all fishing vessels in the fishery maintain on board a satellite-linked vessel monitoring device that allows for automatic and continuous reporting of the vessel's location within the Convention Area. In general, the VMS devices receive a location feed from global positioning satellites, and feed those coordinates, with additional data as requested by the flag nation, via a communications satellite to a land-earth station (LES). In turn, the LES sends the data to a monitoring station(s) of the flag nation. The Conservation Measure also mandates of the VMS, *inter alia*, that the vessel location reporting be within 500 meters accuracy, contain the date/time of the message and the speed and course of the vessel, and that the on board device be tamper proof.

Alternative 1: Status Quo; no action alternative.

NMFS regulations presently require that the operator of any vessel holding an AMLR harvesting permit must "install a NMFS-approved VMS unit on board the vessel and operate the VMS unit whenever the vessel enters Convention waters" (50 CFR 300.107 (a) (4)). Although CCAMLR Conservation Measure 10-04 excepts the krill fishery from the mandated use of a VMS unit, NMFS regulations require VMS use in all CCAMLR fisheries, including the krill fishery. While these regulations bring the United States into compliance with Conservation Measure 10-04, they do not include other provisions that experience in other fisheries has taught NMFS are required for the most effective implementation of a VMS. For instance, NMFS currently requires port-to-port VMS reporting for toothfish shipments imported into the United States. Expansion of port-to-port VMS reporting for all U.S. vessels participating in CCAMLR fisheries would enhance current regulations.

Alternative 2: Mandate use of VMS while the vessel is at sea and develop additional VMS regulations. **(Preferred Alternative)**

This alternative would extend the coverage of the VMS currently required to cover all at-sea operations of the vessel. As such, NMFS could monitor the vessel's activity as it approached Convention waters in *lieu* of requiring the vessel operator to turn on the VMS upon reaching the Convention Area. This full time operation of VMS saves the vessel operator from having to determine when and where to operate the VMS at sea, and allows NMFS to ensure that all Convention Area operation is monitored. Current CCAMLR Conservation Measures do not require such full time monitoring of vessels.

In addition to the full time operation of the VMS, this alternative requires NMFS to develop a complete set of VMS related regulations covering all aspects of VMS operation, akin to the VMS regulatory programs NMFS has developed for other domestic fisheries. This would include VMS unit approval requirements, notification requirements, procedures for VMS failure, and prohibitions. These additional regulations are necessary to ensure that the vessel owner/operators can clearly understand all the requirements placed on them for installing and operating the VMS, and that NMFS can effectively monitor U.S. vessels regardless of their location. This is particularly important given the significant distance between the AMLR fishing grounds and any U.S. fisheries enforcement presence.

II. ACTION: Enhance enforcement capability through participation in CCAMLR's Centralized VMS (C-VMS) program.

Alternative 1: Non-participation in C-VMS (Status Quo ; no-action alternative).

During its Fall 2003 meeting, CCAMLR considered the advice of its Subcommittee on Inspection and Compliance regarding the development and adoption of a Centralized Vessel Monitoring System (C-VMS) and agreed to support a trial C-VMS to be established by the Secretariat and open to all interested parties who wished to participate. During its Fall 2004 meeting CCAMLR adopted a proposal to revise and implement the trial C-VMS. As of this writing, C-VMS applies to all vessels fishing in the Convention Area, except vessels fishing for krill. As adopted, a vessel's VMS must automatically communicate at least every four hours to a land-based fisheries monitoring center of its Flag State, and within time limits, to the CCAMLR Secretariat. The

Secretariat will place the locational data on a password-protected website. The United States informed the Commission that, even though the four-hour reporting requirement applies only within the CCAMLR Convention Area, NMFS will continue to require port-to-port reporting every four hours for any toothfish shipments imported into the United States. NMFS regulations currently require the use of VMS on all vessels holding AMLR harvesting permits, including krill.

Alternative 2: Full participation in C-VMS for U.S.-flagged vessels. **(Preferred Alternative)**

This alternative would require NMFS, and U.S.-flagged vessels fishing for AMLRs, to participate in the C-VMS established by the CCAMLR Secretariat. NOAA/NMFS believes that C-VMS is an effective measure for all RFMOs to ensure that vessels are monitored for compliance, and that in certain circumstances, VMS data are provided to participating nations in order to pursue investigations of potential violations. C-VMS removes the potential that a Flag State could delay or interfere with the transfer of information to a RFMO Secretariat. While some nations see this as a threat to sovereignty, the United States believes that participation in C-VMS is the hallmark of responsible fishing nations seeking to have its vessels participate in an international fishery.

The “centralized” aspect of the VMS comes from the requirement in CCAMLR Conservation Measure 10-04, that participating flag nations forward all VMS reports to the CCAMLR Secretariat as soon as possible (not later than four hours after receipt for the exploratory longline fleet, and upon departure from the Convention Area for all other vessels). The CCAMLR Secretariat can then distribute the VMS data to other Contracting Parties for purposes of active surveillance, inspections or verifying catch documents. The implementation of C-VMS is expected to result in timely responses from the CCAMLR Secretariat to NMFS’s inquiries into fishing activities of a foreign vessel. This timely access to data will result in faster investigations into the veracity of catch documentation. Without C-VMS, NMFS would be required to seek VMS data from the flag nation, and experience has shown that responses to such requests has at times been unacceptably slow. In addition, implementation of C-VMS by NMFS for U.S. vessels will allow NMFS to automate the submission of VMS data to the CCAMLR Secretariat, thereby freeing agency resources from having to respond to VMS data requests from Contracting Parties.

In addition to the VMS enforcement controls discussed above, NOAA/NMFS will use the next opportunity to amend the AMLRCA to add statutory authorities that will enhance its enforcement capabilities under AMLRCA. Primarily, this involves reauthorization of AMLRCA to authorize a significant increase in the maximum civil penalty NOAA can assess for a violation of the AMRLCA, as well as clarification of NOAA’s permit sanction authority under AMLRCA. To date, NOAA has used several enforcement procedures to effectively address the issue of importation of toothfish that was either taken illegally or for which there is improper paperwork. These methods include implementation of a summary settlement program for failure to apply for an import permit, denial of entry of toothfish shipments into the United States when the shipment accompanying the paperwork fails to meet the requirements of the Catch Documentation Scheme, and forfeiture of the catch when the United States determines the fish was taken illegally or there are other aggravating factors. In addition, NOAA/NMFS has worked closely with the U.S. Department of Justice to consider criminal prosecutions when appropriate. While NOAA believes that these enforcement responses have reduced the amount of illegal toothfish entering the United States, NOAA is confident that an increase in the maximum penalty allowed under AMLRCA will allow it to more effectively tailor a civil monetary penalty to the facts and circumstances of any particular case. Experience with regulating the fisheries trade has shown that significant civil penalties are often the most resource effective means to bring a party into compliance.

CCAMLR participants have regularly considered methods for dealing with vessels/companies/persons involved in IUU fishing activities. NOAA has reviewed certain options, including denial of permits, and determined that prophylactic actions against companies with suspected IUU history, or against U.S. persons with a prior violation history, raises significant due process issues. As such, NOAA cannot currently prevent a person from engaging in AMLR fishing or trade in the U.S. based solely on past violations or suspected IUU history. Despite its limited resources, NOAA/NMFS endeavors to pay close attention to vessels and companies with a known IUU history, with shipments of toothfish from fishing trips where IUU fishing is suspected receiving the highest scrutiny. Notably, future prosecutions could include permit sanctions that could prevent a company/person from participating in the fishery.

2.5 Alternatives Considered but Rejected

In preparing this EIS, consideration was given to the potential impacts to seabirds and marine mammals during the course of longline sink rate tests conducted in compliance with Conservation Measure 24-02. CM 24-02 allows for an exemption from the prohibition on daytime line setting in specified CCAMLR areas for vessels harvesting toothfish if vessels can demonstrate minimum specified line sink rates, which have been tested and successfully reduced seabird by-catch below levels of concern.

The CCAMLR Working Group on Incidental Mortality Associated with Fishing (WG-IMAF) and the CCAMLR Working Group on Fish Stock Assessment (WG-FSA) have not raised the issue of seabird or marine mammal hooking or entanglement during the testing for longline sink rates. (Pers. Comm., Kim Rivera, NMFS National Seabird Coordinator and co-convener of WG-IMAF, January 2005). CCAMLR observers do not regularily report bycatch during longline sink rate trials outside of the Convention Area (Pers. Comm., Eric Appleyard, CCAMLR data officer, March 2005). However, according to the observer reports from the two U.S. vessels that tested longline sink rates in the 2003/2004 CCAMLR fishing season, there were no interactions with seabirds or marine mammals during the longline testing trials. Additionally, there have been no reported seabird or marine mammal interactions during longline testing trials by more than 40 New Zealand vessels in the history of the toothfish fishery in Subarea 88.1. (Pers. Comm., Neville Smith, New Zealand Ministry of Fisheries and co-convener of WG-IMAF).

The following are particulars of the CCAMLR line sink rate tests

* Line sink rate tests must be conducted prior to entering the Convention Area.

* Tests can be conducted with (baited) hooks or without. Many fishers conduct the tests without hooks to speed up the tests. When tests are conducted without hooks, there is no possibility of hooking seabirds.

* Tests are typically conducted during the daytime to facilitate observation of the test.

* Line sink rate tests conducted prior to entry into the fishery must be conducted on a minimum of two sets. Fishers typically opt to just do the minimum requirement of two sets.

* Fishers know what weights they need to add to achieve the sink rate. This information is shared within the fleet because fishers have an incentive to achieve the sink rate.

* CM 24-02 allows for a protocol that uses a "bottle" test. This method allows for instantaneous feedback. Thus, in the rare event when they might not achieve the specified sink rate, they can apply more weight to the line or decrease the spacing between weights to achieve the desired sink rate.

Entanglement of marine mammals with longline gear is a rare event in Convention waters. Killer whales and sperm whales have been known to eat toothfish off the longline hook, however no known marine mammal entanglements occurred in longline testing trials by the U.S. vessels (Pers. Comm. Chris Jones NOAA).

For the reasons set out above and due to the lack of any reported entanglements, NMFS believes the chance of birds or marine mammals being caught during these line sink rate tests is extremely low and is not an issue that merits attention at this time. Therefore, there is no protected resource basis for restricting (or considering an alternative to do so) areas that the U.S. longline trials could be conducted to areas where there would be little or no protected species interactions. Additionally, to require U.S. longline vessels to travel to a limited number of specified areas to conduct their testing trials would unnecessarily remove their flexibility in conducting the discretionary longline testing trials and, thereby, would likely impose undue economic costs on these fishers. For these reasons, alternatives to restrict areas where these tests can be conducted were considered, but rejected.

SECTION 3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

3.1.a. Biology and Status of the Stocks -- Finfish

Toothfish

Toothfish belong to the Family Nototheniidae (cod icefish) and are related to other Antarctic commercial species, such as the Antarctic silverfish (*Pleuragramma antarcticum*) and the many species of rock cods (including the striped-eye notothen, *Lepidonotothen kempi*). This large and widespread Antarctic family is found throughout the high latitudes of the Southern Hemisphere and coastal Antarctica. The two species of toothfish (*Dissostichus eleginoides* and *D. mawsoni*) are both large predators with a circumpolar distribution. Direct population counts are not practical due to logistical considerations because both species have remote distributions and are found in deep waters over the continental shelf. Traditional methods of estimating stock size using trawling techniques have proved ineffective, and few scientific surveys of local populations have been conducted. Toothfish are also difficult to age, and no aging techniques have been validated, so age-specific data are not entirely reliable. Much of the available data on species occurrence and general abundance has been gathered from commercial fisheries, and a majority of the population information is based on catch-per-unit-effort (CPUE) data and a few local recruitment surveys. However, this data can still be used to conduct stock assessments and calculate yield rates for certain areas.

Patagonian Toothfish

Patagonian toothfish (*Dissostichus eleginoides*), are found in sub-Antarctic and cool temperate waters between 35^{o} and 55^{o} South, in the southeast Pacific (Macquarie Island), continental shelf areas of the southwest Atlantic (southern Chile, Patagonia, Falkland Islands), and the Southern Ocean (South Georgia, islands and seamounts in the Indian Ocean sector). The depth range of this pelagic species ranges from 50 to 3,850 m, with a seasonal shift during the austral summer to deeper waters. Patagonian toothfish are slow growing and long lived, reaching ages of more than 50 years and sizes up to 215 cm. They are opportunistic predators, feeding on a range of other finfishes, amphipods, shrimp, and krill; Chikov and Mel'nikov (1990) reported mackerel icefish as the preferred prey item. Diet items change with growth, and also vary seasonally with the abundance and migrations of major prey species (Arkhipkin *et al*. 2003). As fishes grow older and larger, they move into deeper waters and show a decrease in their hunting activity levels. Age specific differences in depth distributions are explained by prey availability and cannibalism of juveniles by adults. Biogeographical differences also exist in diet composition (Goldsworthy *et al*. 2002). The species feeds year round, with a small peak in April through August. The Patagonian toothfish is found in the diets of seabirds, seals and sea lions, and other finfishes, although it does not seem to form a major component (Goldsworthy *et al*. 2001). There also appears to be little competition between the Patagonian toothfish and other marine predators.

Patagonian toothfish and Antarctic toothfish are quite similar in size and appearance, and it is likely that incorrect identification (both accidental and intentional) occurs. Two diagnostic features can be used to distinguish between the two species. In Patagonian toothfish, there are narrow, scale-free areas on the top of the head, while Antarctic toothfish heads are fully scaled forward to the front of the eye. While this is a reliable distinguishing feature, it is difficult to use on live fishes. In live fishes, differences in the middle lateral line is an easier characteristic to use- in Patagonian toothfish, it extends forward to the forward end of the ventral fin, while it is very short in Antarctic toothfish.

Maturity is reached late in Patagonian toothfish, at 6 to 9 years of age and 38-60cm (Lack and Sant 2001). Females grow faster and reach greater sizes than males. Fecundity is low, ranging from 48,900 to 528,900 eggs per female, and is dependent on female body size (Chikov and Mel'nikov 1990). While there have been some claims from the fishing industry that toothfish taken in commercial fishing operations were largely senescent and no longer contributing to the population, Everson and Campbell (1991) reported that many fish taken commercially are not only sexually mature, but also in or approaching spawning condition. Spawning takes place over the continental shelf and slope in June through September; the large pelagic eggs are found in the upper 500m of the water column in waters 2200 to 4400 m deep (Evseenko *et al*. 1995). Hatching occurs in October and November. Patagonian toothfish exhibit a low resilience, with a minimum population doubling time of 4.5 to 14 years. This results in a high level of vulnerability to overexploitation through non-optimal harvesting practices.

Stock Structure

Appleyard *et al*. (2002) reported restricted gene flow in Patagonian toothfish populations, indicating separate stocks at the Macquarie Islands, Heard and McDonald Islands, and Shag Rocks/South Georgia. Stock separation has also been reported between the Falkland Islands and South Georgia/Kerguelen Islands. Such separations emphasize that depletion in one location is unlikely to be quickly replaced by immigration from another location.

Stock Assessments

Estimates of age and growth have been made in the southwest Atlantic (Zakharov *et al*. 1976), Kerguelen Islands (Hureau and Ozouf-Costaz 1980), and the Indo-Pacific boundary of the Southern Ocean (Horn 1998). However, as noted before, the aging techniques have not been validated and may be imprecise. Currently, recruitment data are available from only two locations within the CCAMLR area- South Georgia and Heard Island (Constable *et al*. in prep). These data were used to calculate long-term annual yield estimates of 3,690 mt at South Georgia and 4,575 mt at Heard Island. Given the large differences in fishing area between the two locations (32,025 km^2 vs. 111,298 km^2, respectively), it appears that productivity of this species can differ markedly between locations. Such differences in productivity limits the application of yield estimates to other areas, and emphasizes the need to calculate population status and trends for each individual stock.

Although full stock assessments have only been carried out for South Georgia and Heard Island, CPUE data are available for other areas as well. Where reliable data exist, reduced CPUE and clear population declines have been shown, especially in areas that are subject to Illegal, Unreported, and Unregulated (IUU) fishing. IUU fishing is a significant problem threatening toothfish stocks, with serious impacts on both short- and long-term yield estimates.

Antarctic Toothfish

The Antarctic toothfish (*Dissostichus mawsoni*) is endemic to the seas around Antarctica, and found broadly distributed between 55° and 78° South. It is thought that the Antarctic Convergence serves as an ecological barrier for this species (Vukhov 1972). The Convergence may also reduce spatial overlap with the Patagonian toothfish, although the extent of overlap between the two species is not fully known. This pelagic species is found in waters ranging from 0 to 1,600 m. The species is long-lived, reaching ages of 35 years or more. Although Horn (2002) reported that Antarctic toothfish grow faster and attain larger sizes than the Patagonian toothfish, the maximum reported size is only 175 cm. The diet of recruits and juveniles is mainly zooplankton, while adults feed on squid, other fishes, amphipods, and mysids. Maturity is reached late at about 8 years of age and 100 cm. Fecundity is higher than in the Patagonian toothfish, with females producing up to 400,000 eggs per season. While less is known about the biology of the Antarctic toothfish relative to the Patagonian toothfish, the two seem to have many characteristics in common. In particular, the two species both exhibit a low resilience (minimum population doubling time 4.5 to 14 years), and are vulnerable to the effects of overexploitation.

Krill

Krill (*Euphausia superba*) are a crustacean species found in the waters of the Southern Ocean. Although they exhibit a widespread distribution, concentrations are associated with permanent large-scale cyclonic eddies found near topographic features that influence the eastward flowing Antarctic Circumpolar Current (ACC). Hewitt and Linen Low (2000) reported a latitudinal asymmetry in krill distribution, with higher numbers being found in the southwest Atlantic sector. The density and distribution of krill is related to both reproductive activity and water movements. Although concentrations of krill are associated with hydrographic features, Daly and Macaulay (1991) reported that physical processes do not appear to directly affect krill; distribution and behavior is instead a function of the need to acquire food and avoid predators. Densities vary with depth; deeper waters (215-315 m) are preferred over shallower and surface waters. Krill often form aggregations that may range in size from small, discreet swarms to layers that can be up to 35 nmi long and 245 m deep. These layers may contain a significant portion of the biomass within an area.

Of the 85 species of euphausids found worldwide, *E. superba* is the largest, longest lived, and maintains the highest biomass. Krill have been documented in the field to live 5 to 6 years, but experimental results show they may reach ages of up to 10 years. Adult size ranges between 30 and 51 mm (Kang *et al*. 1999). Seasonal sea ice plays a vital role in krill ecology, providing both food and shelter for multiple life history stages (Daly and Macaulay 1991). Adults are found in large concentrations under ice cover feeding on algae and depend on marginal ice zones and associated phytoplankton blooms to maintain energy supplies and promote reproductive development during the winter and early spring. First-feeding larvae also depend on ice-edge blooms as an important and predictable food source. Additionally, ice floes provide protection from predation for larvae and juveniles. Both diet and feeding method change seasonally, switching from raptorial and raked feeding in winter to filter feeding on microzooplankton and phytoplankton in the summer (Nishino and Kawamura 1994).

Krill compete with salps for their phytoplankton food; during years of high salp abundance or low phytoplankton densities, they may experience diminished spawning ability. Salps also affect krill populations by feeding on pelagic krill eggs. As the dominant herbivore and a key prey organism, krill form a major component of the Southern Ocean food web (Watkins and Murray 1998). Consumed in large numbers by a variety of predators, these crustaceans are the principal component of the diets of seals, penguins, other seabirds, certain fish species, and squid (Green-Hammond *et al*. 1985). Krill are also an important component in the diets of many other Antarctic species, including several whale species.

Krill spawn in the upper water column of offshore areas during summer in the southwest Atlantic sector near the South Shetland and South Orkney Islands. They are also abundant around South Georgia, but do not appear to spawn there and the population may be transported there from the Bellingshausen Sea via the ACC. During the summer breeding season, spatial segregation of age classes is seen, with juveniles inshore and breeding adults in offshore areas. Brood size varies between 1,000 and 6,000 eggs and does not appear to be linked to female size (Ross and Quentin 1982). The reproductive season lasts about 2 months, with multiple broods being produced in a given season; on average, each female will release about 20,000 eggs per year. Larval distributions follow the same patterns as adult concentrations (Makarov *et al*. 1985). Larvae metamorphose into juveniles during the winter and early spring of the following year. Large interannual variation is seen in recruitment patterns and resulting densities in the areas around the South Shetland Islands and South Georgia; age structure of the population tends to be dominated by one or two age classes at any given time. A repeating cycle of 4 to 5 years is seen, with 1 to 2 years of good recruitment followed by several poor years.

<u>Stock Structure</u>

At least three separate stocks exist in association with topographic features influencing the ACC. The Scotia Arc-Weddell stock in the northern extension of the Weddell Gyre; the Enderby stock in the Eastern Wind Drift between 20^{o} and 50^{o} East; and the Kerguelen-Gausberg stock in the Eastern Wind Drift between 85^{o} and 100^{o} East;

possible additional stocks reside within the northern extensions of gyres in the Ross and Bellingshausen Seas.

Stock Assessments

Krill maintain the largest biomass of any key species in the Antarctic ecosystem. Estimates of standing stock have ranged from less than 100 million mt to more than 1 billion mt and have included a considerable amount of uncertainty (Hewitt and Linen Low 2002). Biomass surveys have only covered portions of the Convention area, adding to this uncertainty. A more recent estimate by Constable and Nichol (2002) estimate the biomass of krill within Convention areas between 64 and 137 million mt. Of this, an estimated 44.3 million mt are found in areas 48.1, 48.2, 48.3, and 48.4; area 58.4 contains 7 to 8 million mt (Hewitt and Linen Low 2000).

Icefish

Family Channichthyidae, the crocodile icefish, are found throughout the Southern Ocean in the waters of Antarctica and southern South America and consist of 24 individual species, some of which are targeted by commercial fisheries and utilized as a food fish. Members of the family are found in deep waters, up to 2,000 meters, but usually reside shallower than 800 meters. Icefish feed mainly on fishes and krill, and reach a maximum size of 75 cm. In addition to cannibalism by conspecifics (i.e., by the same species), icefish are eaten by seals and sea lions, shorebirds, seabirds, and whales and dolphins. Channichthyids are closely related to other members of the suborder Notothenioidei, such as toothfish and rockcod, but differ in that they lack erythrocytes and hemoglobin (Holeton 1970). Several adaptations, including low metabolic oxygen requirements, sluggish activity levels, and a large heart and blood volume, allow these fishes to exist with this unusual physiology. Icefish stocks characteristically undergo large natural variations in abundance. These fluctuations may be either biological in origin or related to environmental fluctuations. The family in general exhibits medium levels of resilience, with minimum population doubling times between 1.4 and 4.4 years.

Mackerel Icefish

The pelagic mackerel icefish (*Champsocephalus gunnari*), is distributed between 48^{o} South and 66^{o} South, in the islands of the Scotia Sea, including the northern part of the Antarctic Peninsula; Kerguelen, Heard, and Bouvet Islands; the South Atlantic, near South Georgia; and the South Orkneys and South Shetland Islands. The species has a depth range of 0 to 700 m, but is generally found in waters shallower than 300 m. Although this predator can live up to 15 years and reach a maximum size of 69.5 cm, few fishes older than 6 years are present in the population. Natural mortality for this species is age-specific and high relative to other Antarctic fish species, and varies spatially and temporally, perhaps due to krill availability. Mysids, fishes, amphipods, copepods, shrimp, sponges, and fish eggs and larvae all make up a part of its diet, although krill are the preferred prey item when and where available. Juveniles and adults often form dense feeding aggregations around krill swarms (Kock 1981). Diel patterns of vertical migrations, remaining near the seabed during the day and moving up into the water column at night, vary with the local availability of krill and the size of the individual fish (the largest fishes are less likely to migrate). Mackerel icefish are eaten by other icefish, fur seals, elephant seals, penguins, and albatrosses. Many of its predators also feed on krill, and tend to feed more intensively on icefish when krill are not abundant (Everson *et al*. 1999). Consumption of mackerel icefish by predators can be quite high, indicating the possibility for competition between vertebrate predatory species and commercial fisheries (Green *et al*. 1998). Condition and survivorship (M=0.5) of mackerel icefish is closely related to krill biomass, although the influence of krill availability appears to be indirect (Everson *et al*. 1999, Kochkin 1995).

The mackerel icefish is quite similar to the pike icefish (*C. esox*), and the two species ranges overlap in the waters surrounding South Georgia. Several characters can be used to distinguish between the two, including pectoral and anal fin ray counts (25-28 and 35-40 in *C. gunnari*, 22-24 and 31-35 in *C. esox*, respectively). Differences in snout length can also be used to identify the species (similar to head length in *C. gunnari*, longer than head length in *C. esox*), and is perhaps more useful for field identifications.

Mackerel icefish mature at 22-32 cm, with exact sizes at maturity varying with location. Spawning occurs mostly in the winter, although timing may depend on fish condition and krill availability, and varies with location (Everson *et al*. 2000). In the Atlantic Sector, a possible weak second spawning season takes place in summer (January). Spawning migrations take place into bays, and while spawning occurs over much of the shelf, it is at a much lower intensity than inshore. Fecundity (1,500 to 31,100) and size of the large yolky eggs (2.2-4 mm) varies with location, and food availability and timing of maturation affects individual fecundity as well (Kock 1981, Kock *et al*. 2000). Not all mature fishes spawn each year, and the true spawning stock biomass is thought to be ~80% of the total stock of fish of spawning size. Hatching occurs in late winter and early spring and larvae are concentrated in the upper 100 m of the water column in bays or within ~4 miles of shore (Trunov *et al*. 2000). As the fishes grow, they move deeper in the water column but remain nearshore as postlarvae and juveniles to feed on mysids and krill (Kock 1981). Recruitment is variable and differs between fishing grounds, and often shows cyclical patterns and a lack of correlation with spawning stock biomass size. It is thought that recruitment strength from year to year may be related to krill abundance during the hatching period. The mackerel icefish exhibits higher resilience and a greater capacity to rebuild than other Notothenioid fishes due to early maturation, high fecundity, and high growth performance (Kock & Everson 1997).

<u>Stock Structure</u>

Several separate fisheries stocks exist within both the Atlantic and Indian Ocean Sectors. Two or three stocks reside in the Atlantic Sector: South Georgia, South Shetland, and South Orkney Islands; South Georgia; and Shag Rocks (Alekseeva & Alekseev 1997, North 1996). In the Indian Sector, two stocks, which were once thought to exist around Pike Bank and Discovery Bank, are now absent. Additional stocks reside at Heard Bank/Gunnari Ridge, the Kerguelen Shelf, Skiff Bank, and the Shell Banks.

Characteristic differences in *C. gunnari* behavior and biology seem to exist between fishes residing in the Atlantic and Indian Ocean sectors. In the Atlantic Sector, the species is restricted to coastal shelf areas and makes several annual migrations: feeding migrations in October through February to the northern shelf areas; spawning migrations from the northeast to the east and north, and from the northwest to the west and south coasts of South Georgia; and postspawning migrations back to the northeast and northwest. Immature fishes are found within the eastern shelf area. Fishes in the Atlantic sector also grow larger than those found in the Indian Ocean Sector, and differences in growth rates and natural mortality probably exist as well.

Stock Assessments

Stock assessments are typically carried out using bottom trawls at randomly located positions within prespecified depth strata. Because of the scattered nature of mackerel icefish distributions, most hauls contain very few fish but a few contain very large numbers. In the Atlantic Sector, assessments were conducted during the early years of the fishery on icefish in 1975-1978. In Area 48.1, the 1975-76 survey found 20,000 mt around Elephant Island and a comparable amount, 22,162 mt, around South Shetland Island. The most recent stock assessment in 48.1 was carried out in 1998, and found 2,765 mt around Elephant Island, 5,616 mt around South Shetland Island, and a combined biomass estimate for the Statistical Subarea of 8,166 mt. In Area 48.2, surveys around the South Orkney Islands found 140,000 mt in 1975-76 and 40,000 mt in 1977-78. The most recent survey in that area occurred in 1999, and found a total estimated biomass of 3,016 mt. In Area 48.3, early surveys between 1975 and 1982 gave estimates ranging between 1,152 and 226,606 mt. Bottom trawl surveys in the late 1990s indicated episodic declines in abundance; these declines were not attributable to commercial fishing, and may result from shifts in food chain relationships (Everson *et al*. 1999). The most recent survey in 2002 estimated biomass for the Subarea as 47,241 mt.

In the Indian Ocean Sector, recent surveys have estimated biomass in Areas 58.5.1 and 58.5.2. In 58.5.1, a 1996-97 survey of the 1994 cohort found 3,890 mts present in the area in March 1997. This number had dropped to 1,837 mt by May 1997. A brief survey in 1998 indicated that members of the 1994 cohort were nearly absent from the population, but that a new year 1+ cohort was present that would recruit to the fishery in 2002-03. A 2001 survey in Area 58.5.2 estimated 31,882 mt were available in the area; this biomass was low on Shell Bank and concentrated on the southeast part of the Heard Plateau and Gunnari Ridge. Fishery-dependent data in the Indian Ocean Sector indicate a recent sharp decrease in catch-per-unit-effort (CPUE) for the mackerel icefish.

Spiny Icefish

Little is known on the biology of the abundant spiny icefish (*Chaenodraco wilsoni*). It is found widely distributed between 60° South and 78° South, on the

Antarctic continental shelf and Antarctic offshore islands, including the South Orkneys, South Shetland, and Elephant Island. Its circumantarctic range closely matches that of the Antarctic silverfish; quasi-stationary mesoscale hydrological features caused by peculiarities of bottom topography, indented coastline, fluctuations in the position and intensity of the Antarctic Circumpolar Current and wind stress seem to cause discontinuities (Trotsenko *et al*. 1990). This benthopelagic species can be found in depths ranging from 200 to 800 m, but is more common in the shallower waters of the continental shelf, especially on banks less than 250 m deep in areas where local upwelling increases food supply. A predator, spiny icefish feed mainly on fishes and krill; variations in feeding are related to size, location, and interannual prey availability (Pakhomov & Shumatova 1992). Juveniles and recruits are known to feed on smaller zooplankton prey items. It is eaten by penguins, seals, and whales and dolphins. Spiny icefish reach a maximum size of 43 cm and are targeted commercially for utilization as a food fish. The species reaches maturity at about 23 cm, and spawning of the large, yolky, demersal eggs occurs in the austral winter (June-August).

Blackfin Icefish

The blackfin icefish (*Chaenocephalus aceratus*), also known as the Scotian icefish, is a demersal species found in waters 5-770 m deep between 53^{o} South and 65^{o} South. Its range covers Bouvet Island, the Scotia Sea, and the northern part of the Antarctic Peninsula. Blackfin icefish diets consist mainly of fish and krill, but also a wide variety of other items, including shrimp, seastars, mysids, and other planktonic crustaceans. Feeding migrations take this species far from shore into deeper waters (Lisovenko 1988). The main predators of this species are other icefish. *C. aceratus* are a sexually dimorphic species, with females attaining larger sizes (up to 71 cm) and maturing at larger sizes (48-49 cm) than the males (reach 60 cm, mature at 34-40 cm- Lisovenko 1988). A majority (63%) of the female population of blackfin icefish are sexually immature. Short spawning migrations are made in late summer-early autumn to within 12 miles of the coastal zone, where spawning occurs. Fecundity is positively correlated with size. Recruitment strength has been documented to fluctuate from year to year, causing constant fluctuations in the age structure of the populations (Kompowski 1990).

Unicorn Icefish

The unicorn icefish (*Channichthys rhinoceratus*) is a bathydemersal species found from near shore to water depths of greater than 750 m. It is distributed between 46^{o} South and 54^{o} South, and is endemic to the Kerguelen-Heard Plateau . This predator feeds mainly on fishes but also occasionally eats benthic algae. It is eaten mainly by seabirds. The maximum reported size for the unicorn icefish is 60cm.

South Georgia Icefish

South Georgia icefish (*Pseudochaenichthys georgianus*) is known only from the islands of the Scotia Sea and the northern part of the Antarctic Peninsula between 53^{o}

South and 66^{o} South. *P. georgianus* is a demersal species, with a depth range extending from 0 to 475 m. Krill and fishes make up a significant portion of the diet of this predator; sponges are also eaten. Older fishes regularly feed in near-bottom layers, but may seek food in the water column when benthic resources are scarce. The South Georgia icefish's main predators are mackerel icefish and seabirds. It reaches a maximum size of 60 cm, with both males and females reaching sexual maturity at sizes ranging between 38 and 42 cm (5-6 years); it is known to live at least 13 years (Chojnacki & Palczewski 1981). Eggs are spawned in autumn and hatching occurs at the end of winter. Larvae and juveniles are exclusively pelagic; larvae are abundant in the upper 200 m of the water column in early spring (North & Murray 1992).

Stock Structure

The stock structure of the South Georgia icefish is unknown, although early reports indicate that fishes in the region of South Georgia Island do not form a homogenous, stable stock (Mucha 1980).

Squid

Seven star Flying Squid

The seven star flying squid (*Martialia hyadesi*) has a circumpolar distribution and is associated with the Antarctic Polar Front Zone (APFZ- Gonzalez *et al*. 1997). Its most frequent area of appearance is in the Southwest Atlantic, along the outer shelf and slope, in depths ranging from 1,700 to 2,713 m (Gonzalez & Rodhouse 1998, Ivanovic *et al*. 1998). The species is short-lived, about one year, although it appears some individuals may live for up to two years. Because of its short life cycle, populations are likely to respond rapidly to environmental changes, although oceanographic effects are likely mediated via prey items. Because of large effect of physical conditions on populations, annual catches of *M. hyadesi* fluctuate dramatically from year to year (Rodhouse 1991). It is thought that the appearance of large catches may be related to sea surface temperature (SST) anomalies.

Seven star flying squid feed mainly on finfishes (mainly Myctophids), and squid (cannibalistic on small juveniles); krill and amphipods also make up a portion of the diet. The squid themselves are an important component in the diet of several species of albatross and elephant seals, and taken by a variety of other vertebrate predators as well (Rodhouse 1991). The importance to predators diet changes between years though, as the abundance of the squid varies. Timing of spawning is different between locations, although hatching is thought to occur year-round in the Southwest Atlantic (Arkhipkin and Silvanovich 1997).

Argentine Shortfin Squid

The Argentine shortfin squid (*Illex argentinus*) is distributed along the Patagonian shelf and slope between 22^{o} South and 54^{o} South, and is a Southern Hemisphere example of a western boundary current species. Its range overlaps with that of *Martialia hyadesi* on the southern end of the Patagonian shelf edge. Waluda *et al*. (2001a) found that this squid species distribution is associated with areas of thermal gradients. Uncertainty exists about the stock structure, but it is thought that there are 3-4 separate stocks: summer-spawning stock (SSS), south Patagonic stock (SPS), Bonaerensis-northpatagonic stock (BNS), and the southern Brazil stock (SBS- Martinez *et al*. 2002, Haimovici *et al*. 1998).

I. argentinus live for one year and grow and mature rapidly. Males mature faster, although females grow faster and to a greater size. Feeding occurs at night, especially around dusk and dawn; main food items include locally abundant krill and amphipods, as well as other squids (cannibalistic- Tang 2002). Seabirds, including wandering albatrosses and white-chinned petrels, are the main predators on this species. The species undergoes annual feeding migrations, as well as spawning migrations and ontogenetic movements.

Fecundity ranges between 70,000 and 750,000 eggs per female, and depends on body size (Laptikhovsky & Nigmatullin 1992). The spawning season is protracted. The species shows large interannual variations in recruitment strength that are thought to be related to oceanographic factors. Waluda *et al*. (2001b) documented high abundances associated with lower proportions of frontal waters or higher proportions of favorable-SST waters within the hatching area the previous year. SST shows a negative correlation with abundance and catch levels the next season. Due to the Argentine shortfin squid's short life cycle and other life history characteristics, this species is highly susceptible to recruitment overfishing, and conversely capable of rapid recovery.

Crab

Stone crab resources in the Antarctic are composed of a number of species from the Family Lithodidae, but the Antarctic king crab (*Paralomis formosa* and *P. spinosissima*) is the one of the most abundant and important, both ecologically and commercially. Antarctic king crabs concentrate in areas where environmental conditions tend to be more stable, such as the shelf break, but can be located between 160 and 1,518 m depth (Lopez Abellan & Balguerias 1994). In particular they can be found in the areas around South Georgia and Shag Rocks. The abundance of the two species relative to each other is variable, with *P. formosa* being higher some years, and *P. spinosissima* in other years.

<u>Stock Assessments</u>

A January 2000 abundance estimate by Collins *et al*. (2002) at South Georgia found a density of 8,313 individuals per square kilometer. Densities in different areas within the region were variable; this variability was not related to depth, temperature, or current speed, but was correlated with substrate form.

Other Finfish

Lanternfish

Lanternfish (*Electrona carlsbergi*) (Family Myctophidae) have a circumglobal distribution between the Subtropical Convergence and the Antarctic Polar Front (46^o South to 69^o South). This mesopelagic deep-water species is found between 80 and 140 m depth, and forms the main component of the Deep Scattering Layer in the Pacific Sector of the Southern Ocean. Lanternfish are sexually dimorphic with females attaining a larger size (9.6 cm total length) than males (9 cm). Sexual maturation in females is reached at between 7.6 and 7.8 cm. Maturation of the ovaries is continuous and spawning is serial during the long spawning season spanning the austral autumn and winter (Mazhirina 1991). The maximum reported age for this species is 6 years and the minimum population doubling time is between 1.4 and 4.4 years, making it a medium resilience species.

E. carlsbergi feeds mainly on copepods, hyperiid amphipods, and krill, making diurnal feeding migrations following prey to the surface at night. Ostracods, gastropods, and other planktonic crustaceans also form a smaller component of the diet. Lanternfish are eaten by squid, and to a lesser degree by fishes (especially Channichthyid icefish), sea birds, and seals and sea lions. Their contribution to the diet of predators shows seasonal fluctuations due to seasonal movements of this species related to feeding periods and food availability.

The distribution and behavior of lanternfishes are strongly related to environmental conditions and the availability and distribution of zooplankton prey (Kozlov *et al*. 1991). The bulk of surveyed biomass of lanternfish in the Southern Ocean is found within the Antarctic Convergence area (Filin *et al*. 1991). The South Polar Front Zone (SPFZ) provides optimal physical conditions supporting large concentrations of this species and is where they are found most frequently and regularly. Concentrations at the SPFZ are less dense in winter, when the lanternfish are found in deeper waters (>200m).

Striped-eye Notothen

The striped-eye notothen (*Lepidonotothen kempi*) is a benthopelagic species found between 53^o South and 69^o South in the Scotia Arc, South Georgia, the South Sandwich islands, the South Orkney islands, the South Shetland Islands, the northern part of the Antarctic Peninsula, the coast of east Antarctica, Scott and Balleny Islands, and Bouvet Island. Striped-eye notothen belong to the widespread Antarctic family Nototheniidae, which includes other commercially and ecologically important species such as toothfish and the Antarctic silverfish. This species closely resembles two other nototheniid species, *L. squamifrons* and *L. macrophthalma*, with significant overlaps in the morphological and meristic characters used to distinguish between the three species. Scheppenhiem *et al*. (1994) reported evidence that the three 'species' may in fact be populations of only one species, *L. squamifrons*, though conclusive evidence has not yet been presented and the issue remains unresolved.

L. kempi reach a maximum size of 50cm and may live up to 19 years. This selective planktonic feeder is found between 160 and 900 meters depth, feeding on a variety of food items including finfish (cannibalistic), amphipods, copepods, isopods, benthic crustaceans, sea cucumbers, nudibranchs, sponges, sea stars, fish eggs and larvae, polychaete worms, krill, and other planktonic invertebrates. Striped-eye notothens, in turn, are preyed on by conspecifics, seabirds, and seals and sea lions. The size at which this species reaches sexual maturity differs between locations and ranges between 19 and 36cm. This low resilience species exhibits a minimum population doubling time of 4.5 to 14 years and is susceptible to the adverse effects of overfishing.

Rattails and Grenadiers

Four species of grenadiers and rattails (*Macrourus)* exist worldwide; three of these (*M. carinatus*, *M. holotrachys*, and *M. whitsoni*) are found within the Southern Ocean. Grenadiers in the Southern Hemisphere have a circumpolar distribution between 34^o South and 78^o South. These bathypelagic and bathydemersal generalists dominate deep continental shelf and slope fish communities between 200 and 3185 meters depth and share a number of characteristics with their better documented Northern Hemisphere congener, *M. berglax*. Grenadiers harvested in the Southern Ocean are utilized as a food fish and sold under the market name "grenadero". All three species are slow growing and long lived, reaching sizes of 100cm and ages of 30 years or more (Morley *et al*. 2003). They exhibit a number of factors which make them highly susceptible to over harvest and poor management, including a relatively low natural mortality rate; very low resilience, with minimum population doubling times greater than 14 years; low sustainable yields; and a slow potential rate of recovery.

Food items of these predator/scavengers span a wide range of items, including squid, finfish, amphipods, copepods, isopods, shrimp, ostracods, sea cucumbers, polychaete worms, benthic crustaceans, planktonic invertebrates, krill, and mysids. *Macrourus* spp. makes diurnal feeding migrations to the surface in pursuit of prey items (Dudochkin 1988). Grenadiers are eaten mainly by toothfish and elephant seals.

Spawning of *Macrourus* spp. generally occurs during a protracted spawning season spanning autumn and winter. Females spawn their large eggs during a single spawning event in cold waters (De Ciechomski & Booman 1981). Fecundity of grenadiers is low, ranging between 15,000 and 260,000, and increases with size of the females (Morley *et al*. 2003, UNESCO 1976). Sexual maturity is reached rather late, at around 9 years of age and sizes ranging between 21 and 65 cm. This sexually dimorphic species group exhibits a 'bigger-deeper' trend in spatial segregation, so that the larger females are often found at deeper depths than the males. This, combined with other behavioral differences between males and females, makes larger females much more susceptible to being taken as bycatch in longline fisheries targeting other commercial species (Morley *et al*. 2003).

Antarctic Silverfish

The Antarctic silverfish (*Pleuragramma antarcticum*) belongs to the family Nototheniidae, along with toothfish and the striped-eye notothen. This species is distinctive from other Nototheniids in a number of features of its biology and is one of the most phyletically derived species in the family. Although it contains efficient antifreeze glycoproteins and exhibits sluggish behavior as adults like other members of the family, its hematological features in particular differ remarkably, having 3 different hemoglobins instead of just one (Woehrmann *et al*. 1997, Tamburrini *et al*. 1996). The only truly pelagic fish found in Antarctic waters, *P. antarcticum* is found between 0 and 728 meters depth distributed between 60^{o} South and 78^{o} South, and is found on the Antarctic Peninsula; South Shetland, Elephant, Balleny, Scott, and South Orkney Islands; Weddell, Bellingshausen, Ross, and Davis Seas; and Oates, Adelie, Wilhelm, and other coasts of East Antarctica to Prydz Bay. The species reaches a maximum size of 25 cm and a maximum age of 20 years, and shows low levels of resilience, with a minimum population doubling time of 4.5 to 14 years.

The Antarctic silverfish is the most plentiful fish on the Antarctic shelf and plays a pivotal role in High-Antarctic ecosystems due to these exceptional levels of abundance. Main food items include amphipods, copepods, benthic crustaceans, gastropods, polychaete worms, arrowworms, krill, eggs and larvae, and other silverfish (cannibalistic). Ontogenetic changes in diet are seen, with larger items being ingested as the fish grow. The species is preyed on by a number of Antarctic vertebrates, including seals and sea lions, icefish, toothfish, rockcod, other finfish, and shorebirds.

P. antarcticum matures at 3 or 4 years of age, and 12.5 to 13 cm. Fecundity ranges between 4,300 and 17,800 eggs per female, showing an increase correlated with increasing body size (Gerasimchuk 1987). A spawning migration is made to sea areas along the major continental ice shelves where the buoyant pelagic eggs are spawned during the austral spring (Tamburrini *et al*. 1996, Outram and Loeb 1995). The exact timing of spawning varies with location, but in general the spawning period last 3-4 months. Larvae hatch in November and December, and are found in warm shallow waters (0-135 m- Morales-Nin *et al*. 1998). Koubbi *et al*. (1997) reported that the distribution of larvae is strongly tied to hydrological features, especially the development of coastal gyres linked to topography. Postlarvae and juveniles are highly abundant in Antarctic waters during the summer, and are found at deeper depths than the earlier larvae (50-400 m).

Stock Structure

It is likely that the Antarctic silverfish exists as several separate fishery stocks, due to possible spatial isolation. Trotsenko *et al*. (1990) reported that apparent discontinuities in the circumarctic range may be caused by quasi-stationary mesoscale hydrological structures resulting from peculiarities of bottom topography, indented coastlines, fluctuations in the position and intensity of the Antarctic Circumpolar Current, and wind stress.

Blunt Scalyhead

The blunt scalyhead (*Trematomus eulepidotus*) inhabits the continental shelf of Antarctica and nearby islands, including the South Orkneys and South Shetland. Its range extends from 60° South to 78° South. Although it is can be found anywhere between 70 and 650 m depth, it is most commonly found in the shallower waters of the continental shelf, especially on banks less than 250 m deep in areas where nutrients from local upwellings increase the local food supply. Size groupings typically show vertical segregation, with larger fish inhabiting deeper depths (Roshchin 1991). This member of the Family Nototheniidae is a close relative of other rockcod and toothfish. The maximum recorded size for the blunt scalyhead is 34 cm. This species life history characteristics contribute to its low resilience (minimum population doubling time 4.5-14 years). *T. eulepidotus* is a predator and feeds on salps, nudibranchs, amphipods, copepods, polychaetes, krill, other crustaceans, arrowworms, and fish. It is eaten by toothfish, shorebirds, and whales and dolphins.

Spawning of the buoyant pelagic eggs occurs in December through February. Larvae feed mainly on planktonic copepods, while juveniles are often found near the surface in association with krill swarms (Kozlov & Naumov 1987).

3.1.b. Biology and Status of the Stocks -- Cetaceans

Endangered Species Act (ESA) Listed Species

There are six ESA-listed endangered whale species that occur in the CCAMLR Convention Area, including: blue, fin, humpback, right, sei, and sperm whales. The history and status of these six species of endangered large whales as described below were drawn primarily from the special issue of the Marine Fisheries Review "The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973" (Perry, DeMaster, Silber 1999). The comprehensive status reviews included in that issue are based on published literature from about 1980 through 1998.

Blue whale (*Balaenoptera musculus*)

Blue whales in the Southern Hemisphere are assigned to six stock areas designated by the International Whaling Commission (IWC). These areas are consistent with the presumed blue whale feeding locations, although reliable distributional information on blue whales is scarce. True blue whales are found south of the Antarctic Convergence, in the relatively high latitudes. During summer, the true blue whale is found close to the ice edge (south of lat. 58° S) with concentrations between 66-70° S and long. 60-80° E (CCAMLR Division 58.4.2). On a research cruise in 1995/96 surveying cetaceans in CCAMLR Division 58.4.1, an aggregation of blue whales was found near 65° S and 88° E (Thiele *et al*., 2000). Adult blue whales can attain lengths of about 30 m and weigh up to 160 mt in the Southern Ocean.

Since 1965, there have been only seven sightings of true blue whale calves in waters south of lat. 60° S despite IWC/International Decade of Cetacean Research (IDCR) surveys in these areas. The IWC Scientific Committee has agreed that, while a reliable estimate of abundance of Southern Hemisphere blue whales could not be developed because data on these stocks were incomplete; there were more than 500 blue whales in the Southern Ocean. In 1996, the IWC calculated an abundance estimate of 1,255 blue whales by combining data from IWC/IDCR and Japanese Sighting Vessel (JSV) surveys from 1978 to 1988.

Like other balaenopterids, they have fringed baleen plates instead of teeth and ventral grooves which allow for the filtering of large quantities of water during feeding on swarms of euphausiids. During the 1995/96 research cruise, an aggregation of blue whales was found near a highly dense krill patch in CCAMLR Division 58.4.1 (Thiele *et al*., 2000).

Fin whale (*B. physalus*)

The IWC has divided the Southern Oceans into six baleen whale stock areas. These areas loosely correspond to fin whale stocks, but there is still insufficient distributional data on where these whales breed to validate this designation. Most migrate seasonally from relatively high-latitude Arctic and Antarctic feeding areas in the summer to relatively low-latitude breeding and calving areas in winter. These whales tend to migrate in the open ocean, and therefore, migration routes and the location of wintering areas are difficult to determine. Fin whales spend summer feeding in the relatively high latitudes of both hemispheres, including in the Antarctic waters of the Southern Ocean. They are most abundant in offshore waters where their primary prey (e.g., Euphausiids) is concentrated in dense shoals. A CCAMLR/IWC survey of CCAMLR Subareas 48.1, 48.2, and 48.3 during the Austral Summer of 2000 resulted in an abundance estimate of 4,524 (CV 42.37) (coefficient of variability) fin whales in those areas (Reilly *et al*., 2004).

Like other balaenopterids, they have fringed baleen plate instead of teeth and ventral grooves which expand during feeding and allow the whale to engulf large quantities of water along with small crustaceans and fish prey items. The predominant prey of fin whales varies greatly in different geographical areas depending on what is locally abundant. Thus, they may be less prey selective than blue, humpback, and right whales. However, fin whales do depend to a large extent on the small euphausiids and other zooplankton species. In the Antarctic, they feed on krill, *Euphausia superba*, which occurs in dense near-surface schools.

There is some speculation, because of the sharing of the Antarctic krill resource between both whale and non-whale predators, that interspecific competition may be a critical factor in the biology of Southern Hemisphere fin whales. There is no direct information of how such ecosystem level interactions may or may not affect the status of baleen whales. However, studies suggest that competition among whales and other small krill predators in the Antarctic ecosystem is relatively low.

Humpback whale (*Megaptera novaeangliae*)

In general, most humpback whales spend the summer feeding in high-latitude waters and then migrate long distances into low-latitude tropical waters for the winter where they breed and calve. A survey was done of cetacean distribution off the Eastern Antarctic (CCAMLR Division 58.4.1) and humpback whales were the most frequently sighted species, with all sightings west of 120° E (Thiele *et al*., 2000). This survey also found about one-third of all humpback sightings to be made near the ice-edge, and were usually correlated with a strong temperature gradient.

The IWC Scientific Committee has recognized data from the IWC/IDCR and JSV surveys of the Antarctic Ocean as valid for population estimation south of lat. 60° S. Recent data on whale populations estimates issued by the IWC indicate a humpback whale population in the Southern Ocean south of lat. 60° S of 10,000. These recent data are from a CCAMLR/IWC survey of CCAMLR Subareas 48.1, 48.2, and 48.3 during the Austral Summer of 2000 resulted in an abundance estimate of 9,366 (CV 27.9) humpback whales in those areas (Reilly *et al*., 2004).

Like other balaenopterids, they have fringed baleen plates instead of teeth that allow for the filtering of small crustaceans and fish. Deep grooves on the ventral surface allow for throat expansion, increasing the volume of water that can be engulfed and then filtered through the baleen. Southern Hemisphere humpback whales feed almost exclusively on Antarctic krill, *Euphausia superba*. Humpback whales utilize a wide range of feeding techniques, at times involving more than one individual and resembling a form of cooperative participation. The two most observable techniques are lob-tail feeding and bubble-cloud feeding.

Right whale (*Eubalaena australis*)

Northern right whales are now the most endangered of the large whales. Southern right whales, in contrast, have shown signs of recovery over the past twenty years (Best, 1990). No final stock designations for the Southern Hemisphere right whales have been made by the IWC. There have been reported high concentrations of right whales between the subtropical and Antarctic Convergence. Whales were found farthest south in January (the austral summer) and began moving north in February. A best estimate for total Southern Hemisphere right whale abundance is about 7,000 based on a 1998 IWC tally of estimates from separate breeding areas. A CCAMLR/IWC survey of CCAMLR Subareas

48.1, 48.2, and 48.3 during the Austral Summer of 2000 resulted in an abundance estimate of 1,670 (CV 61.67) right whales in those areas (Reilly *et al*., 2004).

Like other balaenopterids, right whales have fringed baleen plates instead of teeth and ventral grooves which expand to allow for engulfing large quantities of water during feeding on small zooplankton. The feeding for right whales occurs in the spring and fall in both hemispheres, where they take advantage of large concentrations of zooplankton, primarily copepods, found in temperate to subarctic waters.

Sei whale (*B. borealis*)

Sei whales are found in all oceans. They migrate long distances from high latitude summer feeding areas to relatively low -latitude winter breeding areas. Compared to other balaenopterids, sei whales appear restricted to more temperate waters and occur within a smaller range of latitudes. They do not associate with coastal features, but instead are found in deeper waters associated with the continental shelf edge. Based on history of catches and trends in CPUE, current sei whale abundance estimates range from 9,800 to 12,000 whales in the Southern Ocean. Like other balaenopterids, sei whales have fringed baleen plates instead of teeth and ventral grooves which expand to allow for engulfing large quantities of water during feeding on small zooplankton. Sei whales consume primarily copepods, but they also prey on euphausiids and small schooling fishes when locally abundant.

In the Southern Hemisphere, there is some evidence that sei whales may minimize direct interspecific competition with blue, fin and minke whales by foraging in warmer waters than do the latter species, by consuming a relatively wider variety of prey, and by arriving later on the feeding grounds than other baleen whales (Kawamura, 1978, 1980, 1994; IWC 1992a). However, Murphy *et al*. (1998) and Fraser *et al*. (1992) suggested that competition among whales and other krill predators in the Antarctic is relatively low. (Clapham and Brownell, 1996).

Sperm whale (*Physeter macrocephalus*)

Sperm whales are often concentrated around oceanic islands and in areas of upwelling and along the outer continental shelf and mid ocean waters. Being deep divers that can remain submerged for long periods, they are rarely found in waters less than 300 m deep. In the Southern Hemisphere, male sperm whales are widely dispersed along the Antarctic ice edge from December to March (austral summer). In contrast, mixed groups of females and immature whales have a southern limit in the South Atlantic of lat. 50-54° S.

Female sperm whales usually inhabit waters deeper than 1,000 m and are found at latitudes less than 40° S, and are thus, usually found far from land (Whitehead, 2002). The larger and older the male, the higher latitudes they inhabit. Large, older males may be found near the pack ice, though they return to lower latitudes for breeding (Whitehead, 2002).

Sperm whales were heavily whaled during the 20th century. Though it is unclear what affect this had on stocks, it is likely that many stocks, males in particular, were significantly reduced (Whitehead, 2002). Utilizing IWC/IDCR and JSV survey data in 1995, Butterworth *et al*. estimated sperm whale abundances south of latitude 60° S from two surveys as 3,163 (CV= 0.39) and 14,387 (CV= 0.185) and south of latitude 30° S from two winter surveys as approximately 290,000 (CV=0.46) and 128,000 (CV=0.44) in a range of 128,000-290,000 (CV= 0.44-0.46) (Butterworth *et al*, 1995). Given the Antarctic latitudes surveyed, these numbers most likely represent a large proportion of male whales.

The sperm whale is the largest whale of the odontocetes (toothed whales) and does not have baleen plates like the balaenopterids described above. The sperm whale's primary prey consists of larger mesopelagic cephalopod and fish species, including the giant squid. Approximately 40 species of cephalopods are consumed by sperm whales worldwide.

Species Not Listed under ESA

Arnoux beaked whale (*Berardius arnuxii*)

Arnoux's beaked whale is widely distributed in the Southern Ocean from the edge of the antarctic pack ice north to approximately 78° S in the Ross Sea, 24° S near Sao Paulo, 37° S near northern New Zealand, 31° S near South Africa, and 29° S near southeastern Australia (Kasuya, 2002). They are one of the largest species of the family Ziphiidae, and their taxonomic status is not settled (Kasuya, 2002). They travel in tight schools of around 2-9 individuals. They feed primarily on deep-water bottom fish, though squid beaks have been found in stomach contents as well (Kasuya, 2002). Age at maturity for females is between 10-15 years and they live about 54 years; while males mature at 6-11 years and live about 84 years. Abundance in CCAMLR waters is unknown. No significant exploitation of this species has occurred.

Hourglass dolphin (*Lagenorhynchus cruciger*)

The hourglass dolphin has a circumpolar distribution in the Southern Hemisphere (Brownell and Donahue, in press). It is generally limited to antarctic and cold-temperate waters. A recent abundance estimate of 144,300 animals (CV = 0.17) was produced for waters south of the Antarctic Convergence from data from IWC/IDCR cruises and Japanese Sighting Survey Program cruises (Kasamatsu and Joyce 1995). No direct fishery for this species has ever existed.

Killer whale (*Orcinus orca*)

Killer whales are known to occur throughout Antarctic waters (Kasamatsu and Joyce, 1995). Many killer whales leave Antarctica during the austral winter and migrate to lower latitudes (Mikhalev *et al*., 1981; Kasamatsu and Joyce, 1995), although there has been very little survey work conducted in the Antarctic in the austral winter (Gill and Thiele, 1997). Killer whales (*Orcinus orca*) are generally considered to constitute a single species with a cosmopolitan distribution in the world ocean (Rice, 1998). However, during the late 1970s, several different groups of researchers independently concluded that, based on differences in morphology, ecology and acoustic repertoire, there were recognizably different forms of killer whales in Antarctica. The most recent description of killer whales in the Antarctic describes three distinct forms, based primarily on the size and location of their white eye patch and on the presence or absence of a dorsal cape (Pitman & Ensor, 2003): Type A (presumably the nominate form) occurs mainly off-shore in ice-free water, has a circumpolar distribution; Type B mainly inhabits inshore waters, regularly occurs in pack-ice, is distributed around the continent and is regularly sighted in the Antarctic Peninsula area; and Type C inhabits inshore waters and lives mainly in the pack-ice; it occurs mostly off East Antarctica.

The abundance for all Antarctic killer whales has been estimated to be around 80,000 individuals (Boyd, 2002). The three stocks of killer whales have different prey choices: Type A feeds primarily on Antarctic minke whales, Type B feeds primarily on seals (although it may also feed on minke and humpback whales), and Type C has only been recorded feeding on Antarctic toothfish (*Dissostichus mawsoni*, Pitman & Ensor, 2003).

Long-finned pilot whale (*Globicephala melas*)

The long-finned pilot whale has a discontinuous distribution in cold-temperate to subpolar waters of the North Atlantic and the Southern Ocean. Its aggregate abundance is thought to be at least in the hundred of thousands (Reeves and Leatherwood 1994). The abundance for Antarctic long-finned pilot whales has been estimated around 200,000 (Kasamatsua and Joyce, 1995). They feed primarily on squid (Olson & Reilly, 2002).

Minke whale (*Balaenoptera bonaerensis* and *B. acutorostrata subspp.*)

The minke whale has a cosmopolitan distribution in polar, temperate and tropical waters worldwide. Several stocks are recognized around the world. Until recently, only one species of minke whales was recognized; however morphologic and genetic evidence have led the Antractic minke whale (*B. acutorostrata*) to be fully recognized in 1990 (Rice, 1998; IWC, 2001; as sighted in Perrin & Brownell, 2002). The Antarctic and dwarf minke (*B. bonaerensis*), a small form of the common minke whale, overlap in the

Southern hemisphere (Perrin & Brownell, 2002). Both species of minke whales typically occur from 55° S to the ice edge to feed during the austral summer and retreat to lower latitudes during the winter to breed; though some minkes have been observed over-wintering in the Antarctic (Perrin & Brownell, 2002). Abundance for both Antarctic and Dwarf minke whales combined is approximately 750,000 (Boyd, 2002). A CCAMLR/IWC survey of CCAMLR Subareas 48.1, 48.2, and 48.3 during the Austral Summer of 2000 resulted in an abundance estimate of 17,615 (CV 28.3%) minke whales in those areas (Reilly *et al*., 2004).

Minke whales are balaenopterids and in the Antarctic, dwarf minke whales feed primarily on myctophid fishes (Kato & Fujise, 2000; as sighted Perrin & Brownell, 2002), where the Antarctic minke feeds primarily on euphausiids. The consumption of prey by one minke whale during its summer and autumn feeding in the Ross Sea is equivalent to what would be taken by a few thousand Adélie penguins (cf. Ichii & Kato 1991, Woehler 1995).

Minke whales are preyed on both by humans and by killer whales. Whaling for minke whales occurs in the Antarctic where the Japanese take approximately 400 adults per year from the Ross Sea under a scientific permit issued by the IWC (Ichii *et al*. 1998, Brown & Brownell 2001).

Southern bottlenose whale (*Hyperoodon planifrons*)

The southern bottlenose whale has an extensive distribution throughout the Southern Ocean from Antarctic north to about 30° S (IWC 1989; Mead 1989). They have not been exploited on a significant scale and are considered abundant; however, there is no population estimate or even rough figures on the relative abundance of this species (Mead 1989).

Southern right whale dolphin (*Lissodelphis peronii*)

The southern right whale dolphin has a circumpolar distribution in the pelagic cold-temperate waters of the Southern Hemisphere (Jefferson *et al*. 1993). No population estimates for this species are available, but it is thought to be reasonably abundant (Reeves and Leatherwood 1994). Because of its pelagic distribution, very few specimens of this species have been collected and genetic information would prove valuable in clarifying this species' relationship within the genus *Lissodelphis*. Southern right whale dolphins are occasionally killed in fishing gear, but no large-scale mortality has been documented. The overall status of this species is unknown.

Strap-toothed whale (*Mesoplodon layardii*)

There is relatively little information for any of the species within the *Mesoplodon* genus. They normally inhabit deep ocean waters (>2,000 m) or continental slopes (200-2,000 m), and the distribution of most species tends to be localized (Pitman, 2002). Strandings indicate that *M. layardii* may have limited migration to lower latitudes during the austral winter (Pitman, 2002). Abundance is unknown for any *Mesoplodon* species; however, *M. layardii* appear to be widespread and fairly common in the Southern Ocean (Pitman, 2002). Mesoplodonts feed primarily on mesopelagic squid, though fish have been found in stomach contents as well.

3.1.c. <u>Biology and Status of the Stocks</u> -- Pinnipeds

Introduction

There are seven species of pinnipeds that occur in Antarctic waters of the Southern Ocean. (Antarctic waters are defined as the marine environment south of the Antarctic Convergence, also referred to in the literature as the Polar Front, an oceanographic feature where warmer waters to the north meet colder waters from the south.) Of the seven species, four are pagophilic phocid seals (crabeater seal, *Lobodon carcinophagus*; Weddell seal, *Leptonychotes weddellii*; leopard seal, *Hydrurga leptonyx*; and Ross seal, *Ommatophoca rossii*), two are otariid seals (Antarctic fur seal, *Arctocephalus gazella*; and Subantarctic fur seal, *Arctocephalus tropicalis*), and finally the southern elephant seal, *Mirounga leonine*. A summary with four sections for each species is provided below. The sub-sections are: (1) Distribution and numbers; (2) Status; (3) Life History; and (4) Trophic Links.

Three species, the Antarctic and Subantarctic fur seals and the southern elephant seal have a greater potential for fishery-marine mammal conflicts. Their centralized breeding, high density in foraging areas rich in resources, and their association with marine frontal zones of high productivity and biodiversity result in higher probability of distributional overlap with fisheries. This is especially true of income breeders such as otariids compared to capital breeders such as most phocid pinnipeds (Boyd 2000). The ice seals have less potential for conflict with fisheries of the Southern Ocean. This is because the ice environment also serves as a refugia from fisheries exploitation as no fisheries occur within the polar pack ice. Ice seals also tend to be more dispersed and less dense in their aggregations than do otariid seals or elephant seals. Environments that are seasonally covered by ice and are subject to fisheries exploitation during ice-free periods are an exception. Crabeater seals and leopard seals are more common in seasonally affected areas than are Weddell or Ross seals.

The distribution and ranges for each species are presented in Figures 1-7. For the three non-pagophilic seals that have the greatest potential for conflict with fisheries exploitation the current status (numbers and population trends) by breeding site are presented in Tables 1-3.

Antarctic fur seal (*Arctocephalus gazella*)

Distribution and Numbers

The breeding range of the Antarctic fur seal is restricted mainly to seasonally ice-free islands south of, or close to, the Antarctic Polar Front with over 95% of the species breeding on South Georgia. Other breeding sites, many fuelled by migrants from South Georgia, are established at South Orkney, South Shetland, South Sandwich, Bouvetøya, Heard, Marion, Macquarie, McDonald, Crozet, Prince Edward and Kerguelen Islands. The total population size was estimated as 1.5 million in 1990 but it is thought that the population may have since increased to over 4 million. (Table 4)

Status

NMFS noted in its March 5, 2004 environmental assessment for the AMLR Harvesting Permit No. 22 issued to Top Ocean, Inc., a U.S. firm operating from Montevideo, Uruguay, that during the 2002/03 fishing season 73 seals were taken by a Polish vessel, of which 47 were released alive. The Japanese fleet took nine seals. All were released alive. The scientific observer's report for the F/V Top Ocean included information that two fur seals were drowned by being brought up in the net due to a piece of broken trawl gear.

Revised data for 2002/2003 reported by the CCAMLR Scientific Committee in October 2004 indicate that a minimum of 114 Antarctic fur seals were caught in krill fishing operations in Area 48, 53 of which were killed and 61 released alive (SC-CAMLR-XXIII/4, paragraph 7.228).

In the 2003/04 season, a total of 142 fur seals were observed killed and 12 seals released alive aboard the F/V Top Ocean. Overall a minimum of 292 fur seals were reported by the United Kingdom scientific observers deployed on six of the nine vessels fishing in Subarea 48.3 (the area including South Georgia and the South Sandwich Islands.)

A U.K. observer was on board the F/V Top Ocean from February 21 to September 21, 2004. Trawling for krill was conducted in Subarea 48.3 from June 8 to 15 and from June 23 to August 2, 2004. The UK observer was present on the vessel in Subarea 48.3 from June 20 to July 20, 2004. Of the 142 observed Antarctic fur seal mortalities on the F/V Top Ocean, 138 were reported between June 23 and August 2, 2004.

The AMLR Harvesting Permit No. 22, issued by NMFS in March 2004, authorized F/V Top Ocean to harvest 30,000 mt of krill in CCAMLR Area 48 until November 30, 2004. Because F/V Top Ocean only harvested 8,100 mt of krill during this period, it applied for an extension of its AMLR permit. On November 30, 2004, NMFS amended Top Ocean's AMLR Harvesting Permit No. 22 authorizing harvest of the remaining 21,900 mt of krill until November 30, 2005, or until the authorized harvest limit was taken, whichever occurs first. Because of its earlier bycatch of fur seals, the extended permit required F/V Top Ocean to use a seal excluder device in addition to any other gear modification or fishing practice that reduces or eliminates Antarctic fur seal bycatch. The extended permit also required F/V Top Ocean to report on the efficacy of the seal excluder device and any other modifications to gear or fishery practices used to avoid seal bycatch. Top Ocean, Inc., has adapted a seal excluder device used by Japanese vessels for its F/V Top Ocean. Also, Top Ocean, Inc., was issued a HSFCA permit by NMFS on February 8, 2005, authorizing this fishing for krill in CCAMLR waters subject to the conditions and restrictions of amended AMLR Harvesting Permit No. 22. Both an AMLR permit and a HSFCA permit are required to fish in CCAMLR waters.

The take of Antarctic fur seals by the F/V Top Ocean in the 2003/04 fishing season was very small when compared to a population census taken in 1999/00 for South Georgia (the area of take) by the Scientific Committee on Antarctic Research (SCAR) Expert Group on Seals (a committee of the International Council for Science) which reported a population of Antarctic fur seals (*Arctocephalus gazella*) of 4,500,000 – 6,200,000 with a growing trend (www.scar.org , SCAR Expert Group on Seals subsite, Status of Stocks, Table 1). These numbers were estimated from the number of breeding females and are based on a standard deviation of 300,000. It is a substantial increase from the1990/91 census reporting a population of 2,700,000. Krill fishing took place during the entire period of this increase.

The twenty-eighth meeting of SCAR was held July 25-29, 2004. The Expert Group on Seals reported that both Antarctic fur seals and sub-Antarctic fur seals continue to increase over their entire range. Antarctic fur seals are not listed as either "threatened" or "endangered" under the U.S. Endangered Species Act.

Antarctic fur seals were almost made extinct by commercial sealing for their fur in the 18th and 19th centuries, perhaps only a few hundred of the seals remaining, and small scale hunting continued until 1907. The species is now protected by the Convention for the Conservation of Antarctic Seals (CCAS), the Antarctic Treaty and the legislation of various countries within its range. In addition, the Antarctic fur seal is listed as an Appendix II species under the Convention to Control International Trade in Endangered Species of Wild Fauna and Flora (CITES). Since protection, the population has been growing steadily, particularly at South Georgia since the 1950s, and population growth is now about 10% per annum (Table 4). Recovery at other sites began presumably from migrants from the South Georgia stock in the late 1950s and in the 1960s.

The importance of krill in the diet of Antarctic fur seals at South Georgia could result in the species being affected by an increased krill fishery in the Southern Ocean as well as by increased competition for krill with other marine mammal species that are now recovering from previous exploitation. Antarctic fur seals have been reported as bycatch in the krill fishery off South Georgia (K.Reid, British Antarctic Survey, pers.comm.).

The entanglement of Antarctic fur seals in man-made debris, particularly around the neck, is a problem as it can cause death by drowning or starvation. A 1988-1989 study at Bird Island, South Georgia, found 208 sightings of entanglement, the main culprits being polypropylene straps, nylon string and fishing net, indicating a figure of 5,000-10,000 fur seals entangled for the entire South Georgia population (Walker *et al*. 1997). The debris is most likely to come from marine traffic in the Southern Ocean.

Unusually high levels of toxic heavy metals have also been found in Antarctic fur seals (De Moreno *et al*. 1997) but the effects and sources of these are uncertain. Some scientists, claiming that the growing population of Antarctic fur seals is now causing environmental problems by polluting lakes and destroying plants in Antarctica, have been pushing for the downgrading of the fur seals' conservation status. However in some areas of its range population growth has slowed far below pre-exploitation levels (Hucke-Gaete *et al*. 2004, Goebel *et al*. 2003).

Antarctic fur seals on World Heritage listed Macquarie Island were afforded additional protection in 2000 by the creation of a new Federal 16 million hectare Marine Park on the eastern side of the island. The Tasmanian government also announced in 2000 an extension to the Macquarie Island Nature Reserve to cover all Tasmanian waters out to three nautical miles surrounding the island

Life History

The breeding season takes place from November to January, the males arriving early to compete, with frequent fighting, for breeding territory that will eventually contain on average 10 females. Females give birth to a single pup 1-2 days after arriving at the rookery and the pups are born from late November through December.

The mother mates 6-8 days after giving birth and then leaves to feed at sea. Depending on local availability of prey resources foraging trips range from overnight to 10 days and range from 40-240 km from the breeding site. Females return to shore after each foraging trip to nurse her pup for 1-2 days. This cycle of feeding and nursing lasts about 4 months. Males do not feed during their time on shore in the breeding season and lose about 1.5 kg in weight per day over the 30 or so days that they are on land.

Adult males measure 1.6-2 m in length and weigh 90-210 kg (average of 188 kg) while adult females are smaller at 1.2-1.4 m and 25-55 kg (average 37 kg). Pups are born measuring 60-73 cm in length and weighing 4.5-6.5 kg, male pups slightly heavier than female pups. Pup mortality over the first year of life has been calculated at 24% and is greater on the denser breeding beaches. Antarctic fur seals are considered shallow divers especially in comparison to other Antarctic phocid seals. They have been known to dive for up to 10 minutes and as deep as 250 m but on average their dives are within 30 m of the surface. Both sexes reach sexual maturity at 3-4 years but males do not attain territorial status until about 6-10 years. Males can live up to 15 years of age, females up to 23 years.

Trophic links

The main food of Antarctic fur seals at South Georgia and the South Shetlands is krill but fish (myctophid species and *Pleurogramma antarcticum*), and squid are also important prey especially outside the breeding season (Daneri and Carlini 1999; Cassaux *et al*. 2003a; Cassaux *et al*. 2003b; Cassaux *et al*. 2004; Daneri *et al*. 1999). The almost total dependence of nursing mothers on krill during the breeding season at South Georgia means that the reproductive success of these colonies is very closely linked to its local availability (Reid and Arnould 1996; McCafferty *et al*. 1998; Croxall *et al*. 1999). Occasionally there are years in which krill abundance is poor and colonies are affected both for that season and, to a lesser extent, for the next season (Croxall *et al*. 1999). The colonies at Macquarie Island and the Kerguelen Islands rely more on a diet of fish and squid (Robinson *et al*. 2002; Lea *et al*. 2002; Cherel *et al*. 1997). Winter diets may depend more on fish (particularly Notothenioids) than during the summer at South Georgia (North 1996; Reid 1995). Antarctic fur seals usually dive to a depth of 30-40 m for an average of about 2 minutes, diving to a shallower depth at night, when they do most of their feeding, than during the day. Leopard seals prey on juveniles and pups especially at higher latitudes (Hiruki *et al*. 1999) and may exert a top-down control of fur seal populations in the South Shetlands that could account for the reduced rate of increase of recovering populations there (Boveng *et al*. 1998). Killer whales are likely also a predator of both juveniles and adults.

Subantarctic fur seal (*Arctocephalus tropicalis*)

Distribution and Numbers

The breeding colonies of the Subantarctic fur seal are generally found on temperate islands in the South Atlantic and Indian Oceans, north of the Antarctic Polar Front. Some populations depend on foraging at the polar front and are sympatric with populations of Antarctic fur seals thus they have been included in this assessment. The largest colonies occur at Gough, Amsterdam and the Prince Edward Islands. Colonies have also recently been established at Tristan da Cunha, St Paul, Îles Crozet and Macquarie Islands (Figure 2). At least 80,000 pups are born annually, giving a worldwide population of between 277,000 and 356,000 (Table 5).

Status

The species was hunted almost to extinction in the 19th century for its fur, and some island colonies were totally wiped out. Small-scale killing for fishing bait and skins took place at Gough Island until the 1950s. All of the colonies are now protected by legislation. Since being afforded protection, Subantarctic fur seals have started to colonize new locations and most populations now show growth rates of 13-15% or more Table 5). The Subantarctic fur seal is listed as an Appendix II species under CITES. There appear to be no major threats currently facing the species.

Subantarctic fur seals on World Heritage listed Macquarie Island were afforded additional protection in 2000 by the creation of a new Federal 16 million hectare Marine Park on the eastern side of the island. The Tasmanian government also announced in

2000 an extension to the Macquarie Island Nature Reserve to cover all Tasmanian waters out to three nautical miles surrounding the island

A recent genetic study was carried out to investigate the potential impacts of commercial sealing and range contractions on the genetic variation and population structure of Subantarctic fur seals (Wynen *et al*. 2000, 2001). The study revealed that despite commercial sealing, high levels of genetic diversity and population structure are still present in the species. Three genetic lineages or clades are apparent, none of which represents fixed geographic distributions. However the seals from Gough, Prince Edward and Amsterdam Islands all differ significantly in the percentages of each clade represented in their populations. The recently established populations at Îles Crozet and Macquarie Island are more similar genetically to each other than they are to any of the potential "source" populations. Results suggest that these populations were recolonized primarily by animals from the Prince Edward Islands and, to a lesser extent, Amsterdam Island.

Life History Traits

The Subantarctic fur seal usually hauls out on rocky shores from November to January in order to breed. The adult males arrive at the breeding grounds just prior to the females and form territories, usually containing between 4-12 females. They defend these territories by means of fighting, vocalization and bluff. The females usually arrive in November-December and their pup is born a few days later with a black coat. Mating takes place about a week after the birth and the female then begins a cycle of feeding at sea for approximately 5 days (although foraging trips lasting a month have been reported) and returning to nurse her pup on land for 2-3 days. The milk that the mothers feed their pups is high-energy, containing approximately 39% fat.

Recent research has revealed that lactating females on Amsterdam Island have one of the longest attendance cycles of the fur seal species, spending an average of 11-23 days at sea from summer to winter (Georges and Guinet 2000). The time that mothers from Amsterdam Island spend ashore nursing their pup is also long, up to 4 days, but remains constant throughout the year. Lactating female Subantarctic fur seals have been recorded foraging up to 530 km from their breeding islands, and appear to forage in association with oceanographic frontal zones where food availability is expected to be greater (Georges *et al*. 2001a). Foraging dives are generally shallow and occur mostly at night when the seals' main prey, myctophid fish, migrate to near the surface. Subantarctic fur seals also consume squid (Georges *et al*. 2001b).

Pup growth during maternal attendance increases for about 220 days of age, after which they begin to lose weight until they wean at around 281 (± 30) days. Adults molt their coats between March and May. Subantarctic fur seal breeding colonies sometimes share space with Antarctic fur seals (*Arctocephalus gazella*) and there is evidence of some inter-breeding between these species at Marion and Macquarie Islands.
Adult males usually measure up to 1.8 m in length and weigh up to 165 kg (average 131 kg), while adult females are about 1.5 m in length and weigh approximately 50-55 kg.

Pups are born about 65 cm long and weighing 4-5 kg. Females reach sexual maturity at 4-6 years of age, males at 4-8 years, although males do not achieve territorial status until 10-11 years of age. Males of the species are known to live over 18 years, females over 23 years.

Trophic links

Less is known about the diet of Subantarctic fur seals compared to Antarctic fur seals but because of breeding and foraging locations krill is presumably not a primary item in the diet. Myctophid fish and cephalopods are primary prey (Goldsworthy *et al*. 2001). Sharks and killer whales are known predators.

Southern elephant seal (*Mirounga leonina*)

Distribution and Numbers

The Southern elephant seal is the largest of the pinnipeds. Its main breeding grounds are the subantarctic islands near the Antarctic Polar Front, the population at South Georgia being the largest and containing approximately half of the entire species. Other important populations are at Macquarie Island, Heard Island and the Kerguelen Islands. Rare births have also been reported from New Zealand, Australia and South Africa. The total population has been calculated at about 600,000 (Table 6).

Status

The Southern elephant seal was heavily exploited in the 19th and 20th centuries for its blubber as a source of oil, reducing its numbers considerably. A controlled hunt of adult males continued at South Georgia until 1964. Any killing of the species south of 60ºS is now regulated by the CCAS, while the species is also protected by legislation in various countries within its range. The Southern elephant seal is listed as an Appendix II species under CITES.

Southern elephant seal numbers have decreased significantly over the last forty years, e.g. by 50% on Heard Island, 84% on Marion Island, 57% on Macquarie Island, 90% on Campbell and Signy Islands, and up to 80% on some of the Kerguelen Islands (Table 6). Numbers at the South Georgia colony have remained relatively stable during this time, while the colony in Argentina is the only one that appears to have been increasing. The reasons for this decline in some populations are not yet understood and the effect seems to be specific to Southern elephant seals rather than other animals in the Southern Ocean. Some have suggested that the problem may be due to competition with other marine predators or due to ocean environmental change but both of these are currently speculative. There is currently not much support for the explanation that the problem is due to direct competition with commercial fisheries because, for example, there is no commercial fishing for deep-water species in the feeding areas of the declining Macquarie Island population. However any future increase in fishing in the region could certainly cause problems for the species. In 1999 an Argentinean marine mammal scientist warned that over fishing is threatening the survival of the Península Valdés population, expressing concern about the ever-increasing volume of squid caught by commercial fishers at the seals' feeding grounds along the edge of the continental shelf.

Hindell *et al*. 1994 directly addressed the possible causes of the decline of the Kerguelen stock at least until the mid-1980s and the current decline of the Macquarie Island stock. As has been noted for observed declines in abundance of northern fur seals in the 1970s and the current decline of Steller sea lions, "whatever factor is causing the decline appears to be operating on the younger age classes, possibly before sexual differences in foraging patterns develop." Further, the authors considered evidence regarding causative factors for the observed population dynamics beyond the narrow confines of single-species models by incorporating hypotheses related to competition and large-scale changes in the physical and biological environment.

The explanation that is perhaps most currently favored is that the Southern elephant seal populations overshot their sustainable population levels after recovering from the previous period of commercial sealing, and that they are now regaining their equilibrium constrained by the finite food resources available. Research is however continuing to determine the causes and the decline in populations may well be a complex combination of factors. The Península Valdés colony faces the additional problem of disturbance caused by relatively uncontrolled tourism, some seals there also having been seen with pieces of net around their necks and oil on their bodies.

In 1999 UNESCO's World Heritage Committee designated Argentina's Península Valdés, an important site for the species, as a World Heritage Site. Southern elephant seals on World Heritage listed Macquarie Island were afforded additional protection in 2000 by the creation of a new Federal 16 million hectare Marine Park on the eastern side of the island. In addition, the Tasmanian government announced in 2000 an extension to the Macquarie Island Nature Reserve to cover all Tasmanian waters out to three nautical miles surrounding the island.

Life History Traits

Southern elephant seals give birth and breed in September-November, the larger males arriving a month before the females and other males in order to fight for dominance and the right to a harem of females. Only the largest 2-3% of males each year gain this right and the number of breeding females to which the successful males have access is large, sometimes exceeding 100. The female gives birth between 0-10 days after coming ashore and does not leave the beach to feed until her pup is weaned. During this time she depends on her stored reserves to sustain her and loses an average of 35% of her body weight, a weight loss of 8 kg per day. The nursing period lasts an average of about 23 days and the pup puts on weight very quickly during this period, gaining about 3.5 - 4 kg per day. The mother mates up to 5 days before her pup is weaned, most matings concentrated in the three days before weaning, and then once her pup is weaned she abandons it and returns to sea. The pup leaves the beach about 3-8 weeks later initiating the onset of nutritional independence. Suitable food may not be near at hand for the pup and that means that the amassed body reserves of the pup are an important aspect in its survival. The weaned size of pups is very variable, some being three times the weight of others.

Adult males, up to 10 times the size of breeding females, also do not feed during the breeding season and may lose up to more than 40%, 12 kg per day, of their body weight while ashore. The amount of time spent ashore by males during the breeding season varies greatly, some breeding males spending more than 60 days and up to 90 days on shore (the females only spend 25-30 days ashore). After an intensive period of feeding the adults return to molt for an average of 30-40 days in January-February. They do not enter the water to feed while molting. Some non-breeding bulls molt on the Antarctic continent itself.

Southern elephant seals show a great difference in size between the sexes and also within each sex. The average weight of fully grown adult males is 2,200 kg (maximum over 4,000 kg), while their average length is 4.2 m (maximum 6.2 m). Male elephant seals at Argentina's Península Valdés are significantly smaller than those in the Falkland Islands and South Georgia. Females typically weigh 500 kg (maximum 1,000 kg) and measure an average of 2.7 m in length (maximum 3.7 m). Pups are born about 1.3 m long, the males slightly heavier at about 50 kg compared to 45 kg, but both sexes weigh roughly the same, about 135-140 kg, by the time that they are weaned. Southern elephant seals are known to dive as deep as 2,000 m for as long as 2 hours. Most females reach sexual maturity at 2-4 years of age. Males may reach sexual maturity at 3-6 years of age but few of them breed until 10 years of age. Southern elephant seals can live for up to 23 years.

Trophic links

The Southern elephant seal ranges widely when not breeding or molting, and spends ten months a year intensively foraging over wide areas in the waters of the Antarctic for squid and fish. Studies using diet derived fatty acid signatures as trophic biomarkers indicated that Southern elephant seals had fish-dominated diets during the winter and when foraging around Antarctic continental shelves. Seals had a more cephalopod-dominated diet during the summer and when foraging pelagically (Bradshaw *et al*. 2003).

The squid, *Psychroteuthis glacialis*, has been identified as a primary prey species in several diet studies of Southern elephant seals foraging in Antarctic waters (van den Hoff *et al*. 2003; Piatkowski *et al*. 2002; Daneri *et al*. 2000, Slip 1995). Large fisheries for squid occur in waters adjacent to the Antarctic. Commercially exploitable squid live in Antarctic waters and exploratory fishing for them has already taken place (New Zealand Ministry of Foreign Affairs and Trade, 1995; CCAMLR, 1996).

Toothfish, *Dissostichus eleginoides*, has also been found to be an important prey item for Southern elephant seals (Goldsworthy *et al*. 2001; Green *et al*. 1998).

The seals dive continuously, day and night, for the entire trip to sea, diving to average depths of 300-600 m and for average periods of 20-22 minutes (Slip *et al*. 1994; Field *et al*. 2001; Hindell *et al*. 1999). They spend 90% of their time underwater, spending only 2-3 minutes at the surface between dives. The deepest dives are made during the day. Adult Southern elephant seals make two return migratory trips of up to 2,000 km each way to their Antarctic feeding grounds each year, once after breeding and the second time after molting (Slip *et al*. 1994). An exception to this is the Argentinean population that feeds in the southern Atlantic Ocean rather than in Antarctic waters (Campagna *et al*. 1999). Weaned pups and juveniles are preyed upon by killer whales and sometimes leopard seals.

Crabeater seal (*Lobodon carcinophagus*)

Distribution and Numbers

Crabeater seals are considered to be the most numerous pinniped species in the world (Siniff 1991). They are found throughout the pack ice that surrounds the Antarctic continent, often in more concentrated numbers around the edges.

It is difficult to determine the true size of the crabeater seal population as only limited counts have been carried out due to the problems of surveying in the inhospitable Antarctic climate (Green *et al*. 1995). It is generally believed that there are around 15 million crabeater seals but early results from the multinational Antarctic Pack Ice Seal Survey that took place in 1999-2000 appear to indicate that numbers of the seals are much less than previously thought. The distribution of crabeater seals is generally dependent on the seasonal movement of the pack ice and they are also found elsewhere in the Southern Ocean and near subantarctic islands.

Status

As with other seals of the Antarctic pack ice, crabeater seals have largely been protected from commercial hunting due to their inaccessibility and the high cost of operating in the area. All killing of seals in the Antarctic region is regulated by the Antarctic Treaty and the CCAS. A Soviet Union commercial sealing expedition however killed 4,000 crabeater seals in 1986-1987.

The species' heavy dependence on krill may cause it problems. As populations of marine mammals that were previously hunted in the Southern Ocean, e.g. cetaceans, recover to pre-exploitation levels then competition for krill will increase.

A report produced in 1999 expressed concern that warming global temperatures are impacting ocean ecosystems much earlier and far more broadly than many experts anticipated, and that if global warming continues then species that depend on the diminishing pack ice, such as crabeater seals, will be threatened by decreased habitat and food supply.

Life History Traits

Crabeater seals usually form breeding groups every spring in the pack ice region. These groups consist of a male, female and pup who normally stay together until the pup has been weaned, roughly estimated to be about 14-21 days after its birth. The male is very aggressive towards other males who take an interest in the female during this time. Pups are born mainly in September and October with a light grey coat that they molt about two weeks afterwards. Breeding takes place after the pup has been weaned. At various times, especially during the breeding season, groups of juvenile and non-breeding seals may congregate on the ice. Crabeater seals molt in January and February. Most crabeater seals have obvious scars, both from predator attacks (e.g Leopard seals) and as a result of fighting during the breeding season.

Trophic links

Crabeater seals feed almost entirely on krill near the Antarctic penninsula but are known to have a more opportunistic and varied diet in other regions. They seem to prefer diving and feeding at night, mostly at dusk and dawn, with shallow dives of less than 40 m lasting less than 5 minutes (Bengtson *et al*. 1992, Nordoy *et al*. 1995). Satellite tracking in one recent research study showed that the seals spent almost all of the night in the water foraging and that most of them were hauled out on the ice and resting by midday (Burns *et al*. 2002). Crabeater seal pups and juveniles are heavily preyed on by leopard seals, especially newly-weaned pups during the spring and summer, and this predation is a key influence on the lifestyle and habits of the species. Killer whales also prey on crabeater seals of all ages.

There is little difference in size between the sexes, male and female adults measuring 2.2-2.6 m in length and weighing approximately 220 kg, although the females are usually slightly heavier. Pups are born about 1.2 m in length and weighing an average of 30 kg. Both females and males achieve sexual maturity at 2.5-6 years, the actual age possibly being dependent on food abundance. Crabeater seals have been known to dive to depths of up to 430 m and for periods in excess of 10 minutes. They can live to about 40 years of age but the average lifespan is 20 years.

Weddell seal (*Leptonychotes weddellii*)

Distribution and Numbers

Usually found on near-shore fast ice (Siniff 1991), unlike the other Antarctic seal species that prefer the pack ice, there are estimated to be about 800,000 Weddell seals around the Antarctic continent (Erickson and Hanson, 1990). Small populations also breed on South Georgia, the South Sandwich Islands, the South Shetland Islands and the South Orkney Islands (Croxall and Hiby 1983).

Status

Weddell seals are widely distributed and abundant, but no good estimate of population size is available. Based on shipboard and aerial censuses, there are probably at least a quarter million in the entire Antarctic, with the largest concentrations in the Weddell Sea (Erickson and Hanson 1990). Large harvests of seals to feed U.S. and New Zealand sled dogs during the mid-1950s apparently depleted the population in McMurdo Sound. During the first 2 years of harvesting by the U.S. station, nearly 25 percent of the 2000 seals that lived in McMurdo Sound were killed for dog food. Nearly all were adults. Kills of 75 to 150 per year continued from the late 1950s through 1982. Immigration of juveniles fueled population growth, but there was another unexplained decline during the 1970s, with the population reaching its lowest point in 1976 to 1978. Recent data from McMurdo Sound, where human impacts on Weddell seals are perhaps greater than throughout the species range, indicate that the abundance of a resident population has remained stable over time (1975-2000) despite annual fluctuations (Cameron and Siniff 2004).

Weddell seals have been protected in the past from commercial hunting by their inaccessibility, although many were killed to provide food for sled dogs, the practice is no longer permitted. All killing of seals in the Antarctic region is now regulated by the CCAS and the Antarctic Treaty. However a commercial hunt of 107 Weddell seals was carried out by the Soviet Union in 1986-1987.

The importance of krill in the diets of the fish and squid, on which Weddell seals feed, along with current pressures on krill stocks from the commercial fishery, could result in the species experiencing a diminished food supply.

Life History Traits

More is known about the lifestyle of the Weddell seal than any of the other Antarctic species. Females haul out on the fast ice in pupping colonies in September (in the more northerly areas), October and November in order to give birth to their pup. The females in a colony are well spaced out and the location of these colonies is alongside annual tide cracks or broken ice. The female nurses her pup for 5-6 weeks, the pup often starting to accompany its mother into the water after about two weeks.

Towards the end of the nursing period the female mates under the ice, the males having maintained underwater territories beneath cracks in the ice with access to several females. Weddell seals use their specially modified front teeth to maintain ice holes in the fast ice to breathe. Studies have shown that adult seals are usually faithful to the same pupping colonies each year, most of them staying within tens of kilometers of the same site all year round. Immature Weddell seals tend to inhabit the pack ice all year round rather than the fast ice region, only moving to the fast ice and selecting a colony when they reach maturity. Weddell seals molt from December to March.

Adult males can measure up to 2.5-2.9 m in length, adult females slightly longer at up to 3.3 m. Weddell seals can weigh up to 400-600 kg. Pups are born measuring about 1.2-1.5 m in length and weighing 22-30 kg. The juvenile mortality rate for Weddell seals is less than that of the other Antarctic species because of the lesser threat of predation. Individuals have been known to dive up to 600 m in depth and a 73 minute dive was once recorded. Females become sexually mature at about 3-6 years, males at 7-8 years. Weddell seals can live up to 22 years of age.

Trophic Links

Being versatile feeders, the main food for the Weddell seal is fish, such as the Antarctic cod and Antarctic silverfish, *Pleurogramma antarcticum* (Burns *et al*. 1998). They also eat some cephalopods and crustaceans (Cassaux *et al*. 1997). Young seals in the pack ice region are more dependent on pelagic prey. Recent research using video cameras attached to Weddell seals showed that the seals are stealth hunters, approaching within centimeters of cod without startling the fish, and that they do not appear to use sound to hunt, relying instead on their acute underwater vision and often using the under-ice surface for backlighting (Davis *et al*. 2003). The seals were observed flushing out smaller fish by blowing air into sub-ice crevices, and were able to return to a small air hole in the ice after traveling almost 3 km away. Weddell seals are excellent divers and feeding dives to depths of 200-400 m for periods of up to 15 minutes are common (Hindell *et al*. 2002). Adult seals suffer little from predation due to their inaccessible location in fast ice and heavy pack ice regions. However some Weddell seals, especially younger seals, are preyed upon by killer whales and to a lesser extent by leopard seals, particularly in the spring and summer when the ice breaks up.

Leopard seal (*Hydrurga leptonyx*)

Distribution and Numbers

The leopard seal is widely distributed in high southern latitudes. It is usually found on the edges of the Antarctic pack ice, but individuals are also present year-round and seasonally on some subantarctic islands (Borsa 1990). Population size is difficult to determine, especially as the leopard seal inhabits such a large inhospitable area and is usually solitary, but an estimate of 220,000-440,000 has been made (Erickson and Hanson 1990).

Status

As with other seals of the Antarctic pack ice, leopard seals have been protected from commercial hunting due to their inaccessibility and the high cost of operating in the area. All killing of seals in the Antarctic region is regulated by the Antarctic Treaty and the CCAS. In 1986-1987 however two Soviet commercial sealing ships killed 649 leopard seals. There is no indication, however, that leopard seals are threatened or depleted.

Life History Traits

The distribution of leopard seals is significantly influenced by the annual expansion and contraction of the pack ice surrounding the Antarctic continent. Higher densities of leopard seals are found on broken ice near the pack ice edge. The leopard seal often hauls out on islands near the continent when the ice contracts, and immature seals are known to gather on subantarctic islands as they migrate north during late autumn and winter when the ice expands. Very little is known about the breeding habits of the leopard seal, but it has been suggested that pupping normally takes place in November and December and that there is a short breeding season about a month later, mating probably taking place in the water.

It is thought that leopard seals most likely give birth on non-fast ice and that there is probably a very short period of suckling, lasting perhaps a month, in which the pup puts on weight and protective blubber very quickly. Leopard seals are known to be very vocal during the breeding season, their calls tending to be soft and lyrical. There are also some regional variations in their calls, which has led to suggestions that there are separate breeding populations with only limited interactions. Pups are born with a soft thick coat, being very similar to the adult coat that is grey colored and spotted, darker on the back than on the front. Adults usually molt between January and February.

The leopard seal is the largest of the four Antarctic seal species. Adult males can measure up to 2.5-3.2 m in length and weigh 200-455 kg, while adult females are slightly larger at 2.4-3.4 m in length and 225-591 kg. Pups are born measuring 1.5-1.6 m in length and weighing about 35 kg. The pup mortality rate in the first year is about 25%. Females probably achieve sexual maturity at 3-7 years, males at 2-6 years. The longest dive recorded is about 15 minutes - due to its feeding habits the leopard seal probably does not need to dive deeply. Leopard seals can live for over 26 years.

Trophic links

Leopard seals eat an amazingly large variety of food, using their wide gaping mouths and massive jaws to great effect. As a circumpolar top trophic level predator their diet varies largely with locality and availability of locally abundant prey (Hiruki *et al* 1999). In winter their most important food is krill. Krill may be especially important food source for juveniles (Walker *et al*. 1998). They also eat cephalopods, fish and other seal species, especially newly-weaned crabeater seals during December and January. Penguins and fur seals are seasonally important part of the diet of some leopard seals in certain localities (Walker *et al*. 1998). Fur seal pups are a major prey item in some areas and leopard seal predation may exert a substantial top down effect in limiting fur seal populations locally (Boveng *et al*. 1998). Southern elephant seals have also been found in leopard seal diets (Walker *et al*. 1998). The only known predator of leopard seals is the killer whale.

Ross seal (*Ommatophoca rossii*)

Distribution and Numbers

Named after the British explorer who obtained the first specimen, less is known about the Ross seal than any of the other Antarctic seals. The species is mostly found on the pack ice around the Antarctic continent, with a wide but dispersed circumpolar distribution. It is very difficult to determine how many of the species there actually are. The Ross seal is however the rarest of the four seal species breeding on the Antarctic pack ice, and one population estimate has been made of about 131,000 (Erickson and Hanson 1990). The greatest abundance of Ross seals appears to be in the Ross and King Haakon VII Seas. Wandering seals have been reported north of 60º S only on very rare occasions.

Status

Ross seals have been protected from large-scale commercial hunting due to their inaccessibility and the high cost of operating in the area. They are protected by the Antarctic Treaty and the CCAS, although 30 were killed in 1986-1987 for commercial purposes under a special permit. In January 1998 the Environmental Protection Protocol to the Antarctic Treaty was ratified, implementing environmental measures such as the banning of mining and oil drilling in Antarctica for at least 50 years, along with the banning of refuse disposal and the use of pesticides in the region. The lesser importance of krill in the Ross seal diet should probably prevent the species from being badly affected by current pressures on krill stocks from the commercial fishery and from increased competition by other Antarctic marine mammals.

Life History Traits

Ross seals are the least studied of the Antarctic seals due to their dispersed and isolated distribution. They are usually observed as solitary individuals, appearing to prefer larger and more concentrated ice located further in from the ice pack edge than that preferred by leopard and crabeater seals. There is not much known about the Ross seal's breeding season, though it appears to take place in November when observations of pups increases (Southwell *et al*. 2003). The female nurses her pup alone for a short period, perhaps 2-3 weeks, and breeding may occur about one month after the pup is weaned. They are thought to molt from late December and January and are subsequently more likely to be fasting and hauled-out during this period (Southwell 2003; Skinner and Westlin-van Aarde 1989; Skinner and Klages 1994).

Adult male Ross seals measure 1.7-2.1 m in length and weigh 130-215 kg, females generally larger at 2-2.4 m and 160-200 kg. Pups are born measuring 1.05-1.2 m in length and weighing about 27 kg. It is thought that females achieve sexual maturity at 3-4 years, males at 2-7 years. Ross seals live at least to age 20 (Skinner and Klages 1994).

Trophic links

The Ross seal is thought to specialize in feeding on cephalopods, particularly squid but is also known to feed on fish (*Pleurogramma antarcticum*) (Skinner and Klages

1994). What little information exists on dive depths of the Ross seal indicates they dive to depths of several hundred meters and prey on diurnally migrating prey. They dive primarily at night and haul out during the day. They dove deeper than crabeater seals foraging in the same area on krill (Bengtson and Stewart 1997). Killer whales prey on some Ross seals and there is possibly also some predation by leopard seals.

Table 4 (Sec. 3.1.c.): Estimated sizes and trends of Antarctic fur seal (*Arctocephalus gazella)* populations.
Source: (SCAR 2002) Status of Stocks Report. Status of stocks tables for Antarctic pinnipeds are annually updated by the SCAR Expert Group on Seals website: (http://www.seals.scar.org/pdf/statusofstocs.pdf).

Site	Pup numbers	Total population	Year of census	Mean annual rate of change	Reference
Macquarie Island	152[a]		1999/00	increasing (1988/89 to 99/00)[a]	Goldsworthy (pers. comm.)
	164[b]		2001/02	increasing	Goldsworthy (pers. comm.)
Heard Island	248		1987/88	+ 23% (1962/63 to 87/88)	Shaughnessy (1993)
	1,012		2000/01	+ 20.1 % (1962/63 to 2000/01)	Goldsworthy (pers. comm.)
McDonald Island	100	300	1979/80	increasing	Johnstone (1982)
Iles Nuageuses (Iles Kerguelen)	2,500[c]		1984/85	increasing	Jouventin & Weimerskirch (1990)
	5,000	?	2000	Increasing	Lea (pers. comm.)
Courbet Peninsula (Iles Kerguelen)	2	?	1984	Increasing	Bester and Roux (1986)
	>200	?	1998	Increasing	Guinet (pers. comm.)
	1,500-1,700	?	2000	Increasing	Lea (pers. comm.)
Ile de la Possession (Iles Crozet)	67	?	1992/93	+ 21.4% (1983 to 92)	Guinet *et al*. (1994)
	234	?	1999/00	+ 16.9% (1992 to 1999)	Guinet (pers. comm.)
	295	?0	2003/04	+ 5.9% (1999/00 to 2003/04)	Guinet (pers. comm.)
Marion Island	251[c]	1,205[d]	1994/95	+ 17% (1988/89 to 94/95)	Hofmeyr *et al*. (1997)
	796[c]	3,821	2003/04	+13.8% (1994/95 to 2003/04)	Hofmeyr *et al*. In preparation-a
Prince Edward Island	?	200	1981/82	increasing	Kerley (1983)
	400	2,000[i]	2001/02	+ 16.2%	Bester *et al*. (2003)
Nyrøysa (Bouvetøya)	2,000	>9,501	1989/90	+7.0% (1978/79 to 89/90))	Bakken (1991)
	15,523[c]	66,128	2001/02	+0.1%	Hofmeyr *et al*. In preparation-b

Table 4. (cont.)

Site	Pup numbers	Total population	Year of census	Mean annual rate of change	Reference
				(1996/97 to 2001/02)	
South Georgia	<600,000[c]	$2.7x10^6$ [f,g]	1990/91	+ 9.8% (1976/77 to 90/91)	Boyd (1993)
		$4.5\text{-}6.2x10^6$ [f,g]	1999/00	+6% to 14% (1990/91 to 99/00)	Boyd (pers. comm.)
South Sandwich Islands	<500	<2,000	1962/63	?	Holdgate (1962)
	346		1997/98	stable	Boyd (pers. comm.)
South Orkney Islands	<1,000		1970/71	?	Laws (1973), Boyd (1993)
South Shetland Islands	9,300		1991/92-95/96	+ 11% (1994/95 to 95/96)	J.L. Bengtson and D. Torres (pers.comm), Aguayo *et al*. (1992)
	10,057		2000/01	+ 0.9% (1995/96 to 01/02)	Goebel *et al*. (2003)
Cape Shirreff (SSSI No32)	5,313		1991/92	+ 14%[i] (1986/87 to 91/92)	Hucke-Gaete (1999)
	8,455		1999/00	+ 6%[i] (1991/92 to 99/00)	Vallejos *et al*. (2000)
	8,577	21,190	2001/02	+4.6%[i] (1992/93 to 2001/02)	Hucke-Gaete *et al*. (2004)

a - For populations of both *A. tropicalis* and *A. gazella*.
b - Corrected for observer undercount.
c - Corrected for precount mortality.
d - Recalculated from population values in publication .
e - Number of breeding females.
f - Estimated from the number of breeding females.
g - Standard deviation = 300,000.
h - Standard error = 140.
i - Calculated from pup counts.

Table 5 (Sec. 3.1.c.): Estimated sizes and trends of subantarctic fur seal (*Arctocephalus tropicalis*) populations.
Source: (SCAR 2002) Status of Stocks Report. Status of stocks tables for Antarctic pinnipeds are annually updated by the SCAR Expert Group on Seals website: (http://www.seals.scar.org/pdf/statusofstocs.pdf).

Site	Pup numbers	Total population	Year of census	Mean annual rate of change	Reference
Macquarie Island	152 [a]		1999/00	increasing (1988/89 to 99/00) [a]	Goldsworthy (pers. comm.)
Heard Island	1	13	1987/88	?	Goldsworthy & Shaughnessy (1989)
	1	13	2000/01	?	Goldsworthy (pers. comm.)
Ile Amsterdam	>9,638 [b]		1992/93	+ 0.4% (1981/82 to 92/93) [e]	Guinet *et al*. (1994)
	(partial census)		2002/03	Stable 1992/93 to 2002/03	Guinet (pers. comm.)
Ile Saint Paul	365		1992/93	+ 23.8% (1984/85 to 92/93) [e]	Guinet *et al*. (1994)
Ile de la Possession (Iles Crozet)	190		1990/91	+ 21.6% (1978-91) [e]	Guinet *et al*. (1994)
	251		1999/00	+ 3.1% (1990/91-1999/00) [e]	Guinet (pers. comm.)
	322		2003/04	+6.4% (1999/00-2003/04)	Guinet (pers. comm.)
Marion Island	10,137 [c,d]	48,658	1994/95	+ 1.8% (1988/89 to 94/95)	Hofmeyr *et al*. (1997)
	14,915 [c,d]	71,591	2003/04	+4.2% 1994/95 to 2003/04	Hofmeyr *et al*. In preparation
Prince Edward Island	5,372 [c,d]		1988/89	+ 9.7% (1981/82 to 88/89)	Wilkinson and Bester (1990)
	15,000 [f]		2000/01	+ 9.5% (1987/88 to 2000/01)	Bester *et al*. (2003)
Gough Island	>53,076 [b,c,d]		1977/78	+ 14.9% (1955 to 1977/78) [e]	Bester (1987)

Table 5. (cont.)

Site	Pup numbers	Total population	Year of census	Mean annual rate of change	Reference
Tristan da Cunha	50	250	1993/94	Increasing	C. Glass (pers. comm.)
	?	700	1998/99	Increasing	C. Glass (pers. comm.)
Nightingale Island (Tristan da Cunha Group)	?	>500	1998/99	Increasing	C. Glass (pers. comm.)
Inaccessible Island (Tristan da Cunha Group)	>3	>200	1999/00	Increasing	P.G. Ryan (pers. comm.)

a - For populations of both *A. tropicalis* and *A. gazella*.
b - Extrapolation based on a proportion of the total populated area.
c - Corrected for observer undercount.
d - Corrected for pre-count mortality.
e - Recalculated from population values in publication.
f – Extrapolated from peak adult male counts, and known adult male:pup ratios, in breeding colonies.

Table 6 (Sec. 3.1.c.): Estimated sizes and trends of southern elephant seal (*Mirounga leonina*) populations within the three stocks of the Southern Ocean.
Source: (SCAR 2002) Status of Stocks Report. Status of stocks tables for Antarctic pinnipeds are annually updated by the SCAR Expert Group on Seals website: (http://www.seals.scar.org/pdf/statusofstocs.pdf).

Stock	Locality	Year of census	Estimated pup production	% annual rate of change	Period of change	Trend in population abundance	Reference
South Georgia	South Georgia	1995	113,444	0	1985-1995	Stable	Boyd *et al*. (1996)
	South Orkney Islands	1985	<100	?	1948-1985	Uncertain	McCann (1985)
	Bouvetøya	1998	89	?	-	Uncertain	Kirkman *et al*. (2001)
	Falkland Islands	1960	~1,000	?	-	Uncertain	Laws (1960)
	Sea Lion Island	2001	522	0	1989-2001	Stable	Galimberti *et al*. (2001)
		2003	501	-10.9	2002-2003	Declining?	Galimberti (pers. comm.)
	GoughIsland	1998	18	-3.3	1975-1998	Declining	Bester *et al*. (2001)
	King George Island	1995	476	-5.7	1980-1995	Declining	Vergani and Stanganelli (1990), Carlini (pers. comm.)
		1999	301	-6.0	1995-1999	Declining	Carlini (pers. comm.)
		2003	290-400	?	1999-2003	Fluctuating	Carlini (pers. comm.)
	Nelson I. (Duthoit Pt. only)	1985	106	?	-	Uncertain	Vergani *et al*. (1987)
		2003	50-135	?	1985-2003	Fluctuating	Carlini (pers. comm.)
	ValdésPeninsula	1982	6,737	+5.1	1975-1982	Increasing	Vergani *et al*. (1987)
		1999	13,655	+3.6	1982-1999	Increasing	Lewis *et al*. (1998), Lewis (pers. comm.)
		2001	14,510[a]	+3.5	1982-2001	Increasing	Lewis (pers.comm.)
	Livingston I. (Cape Shirreff only)	2003	3-84	?	1998-2003	Fluctuating	Goebel (pers. comm.)
Iles Kerguelen	Marion Island	1994	423	-4.3	1986-1994	Declining	Pistorius *et al*. (1999)
		1997	423	-2.5	1991-1997	Declining	Pistorius *et al*. (1999)
		1999	434	0	1994-2001	Stable	Pistorius *et al*. (2004)
		2003	488	+3.3	1997-2003	Increasing	McMahon *et al*. (2003)
	Heard Island	1985	16,300	~-1.8	1949-1985	Declining	Burton (1986), Slip and Burton (1999)
		1992	17,000-18,000	?	1985-1992	Increasing?	Slip and Burton (1999)
	Iles Kerguelen (Courbet)	1977	45,000	-4.1	1970-1977	Declining	Van Aarde (1980)

Table 6. (cont.)

Stock	Locality	Year of census	Estimated pup production	% annual rate of change	Period of change	Trend in population abundance	Reference
		1992	43,000	0	1984-1992	Stable?	Guinet *et al*. (1992)
		1997	43,782	+1.1%	1987-1997	Stable/incre-	Guinet *et al*. (1999)
	Iles Crozet (Possession)	1976	~ 3,000	-5.8	1966-1976	Declining	Barrat and Mougin (1978)
		1992	575	?	1980-1992	Decreasing	Guinet *et al*. (1992)
		1997	570	0	1990-1997	Stable	Guinet *et al*. (1999)
Macquarie	Macquarie Island	1985	24,000	-2.1	1949-1985	Declining	Hindell and Burton (1987)
		1997	19,300	-1.4	1988-1997	Declining	Burton (pers. comm.)
		2003	22,200	+1.6	1997-2003	Increasing	Burton (pers. comm.)
	Campbell Island	1986	5	-8.6	1947-1986	Declining	Taylor and Taylor (1989)
	Antipodes Island	1978	113	?	-	Uncertain	Taylor and Taylor (1989)

[a] – 4 % mortality added (actual pup production included adult females, weaned pups and dead pups).

The source of Figures 1 - 7 on the distribution by species for Antarctic pinnipeds is the SCAR Expert Group on Seals website: (http://www.seals.scar.org/docs/species.htm).

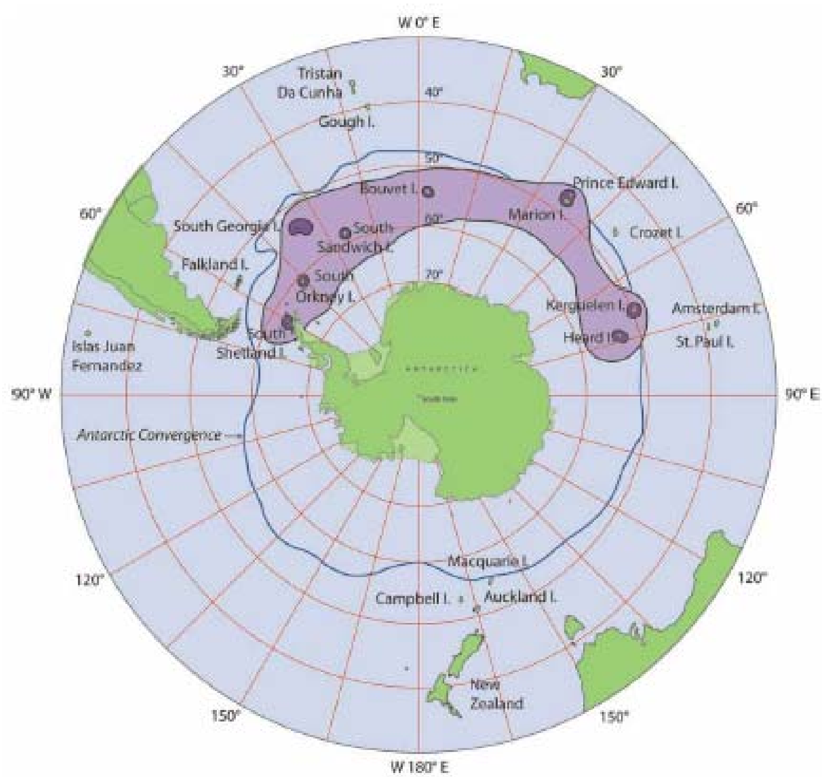


Figure 1. Distribution (breeding range) of Antarctic fur seals.

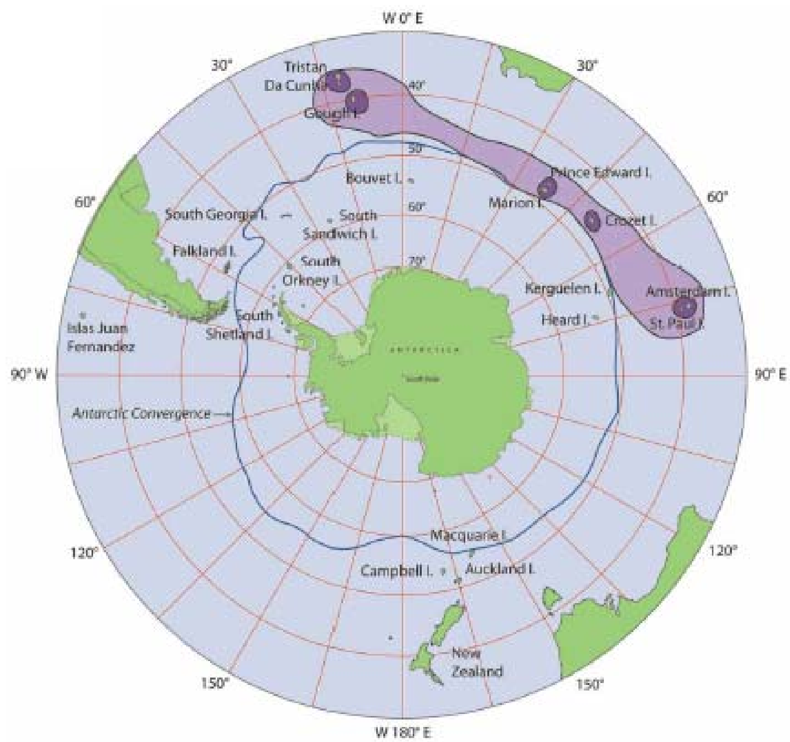


Figure 2. Distribution (breeding range) of the Subantarctic fur seal.

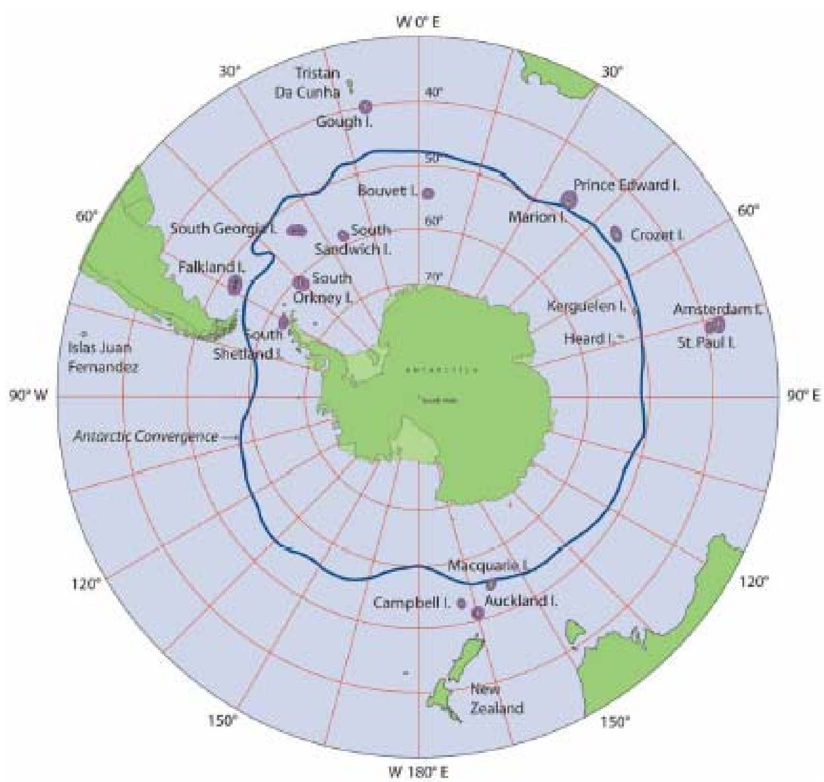


Figure 3. Breeding range of southern elephant seals.

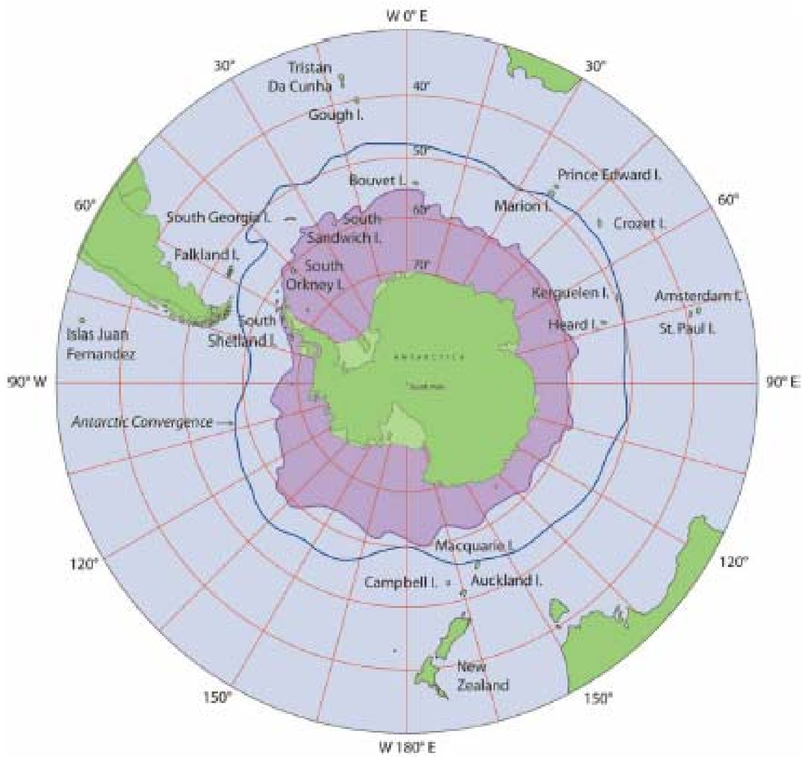


Figure 4. Distribution of the Crabeater seal.

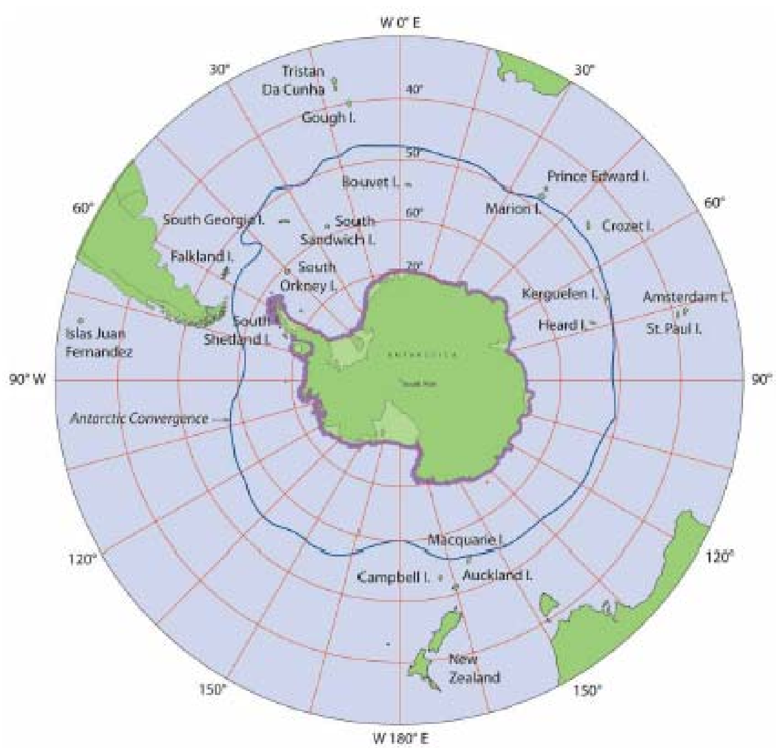


Figure 5. Distribution and range of the Weddell seal.

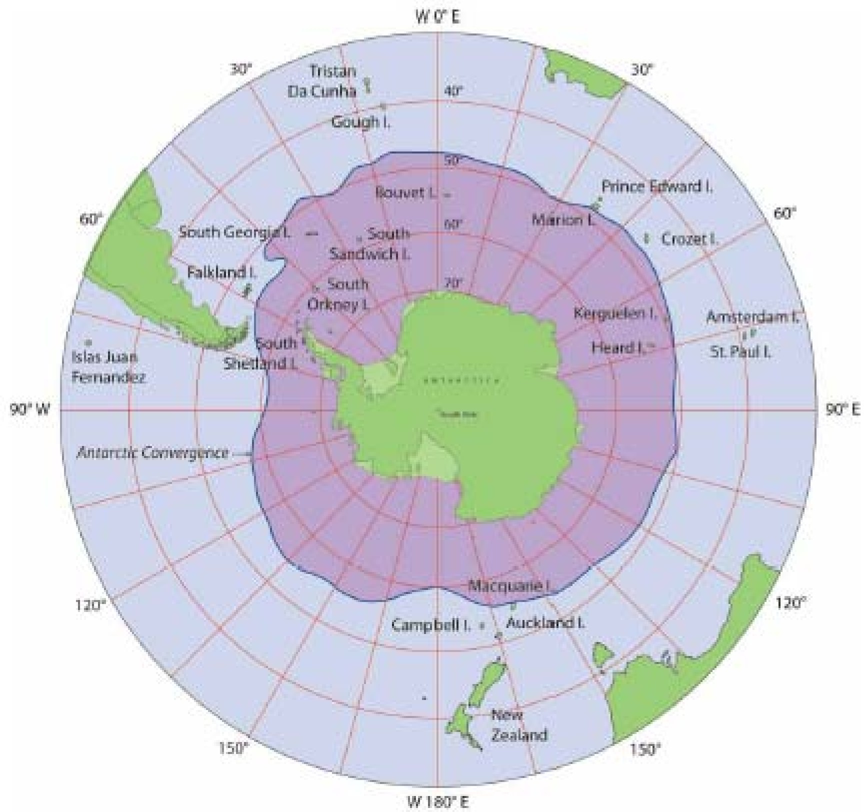


Figure 6. Distribution of the Leopard seal.

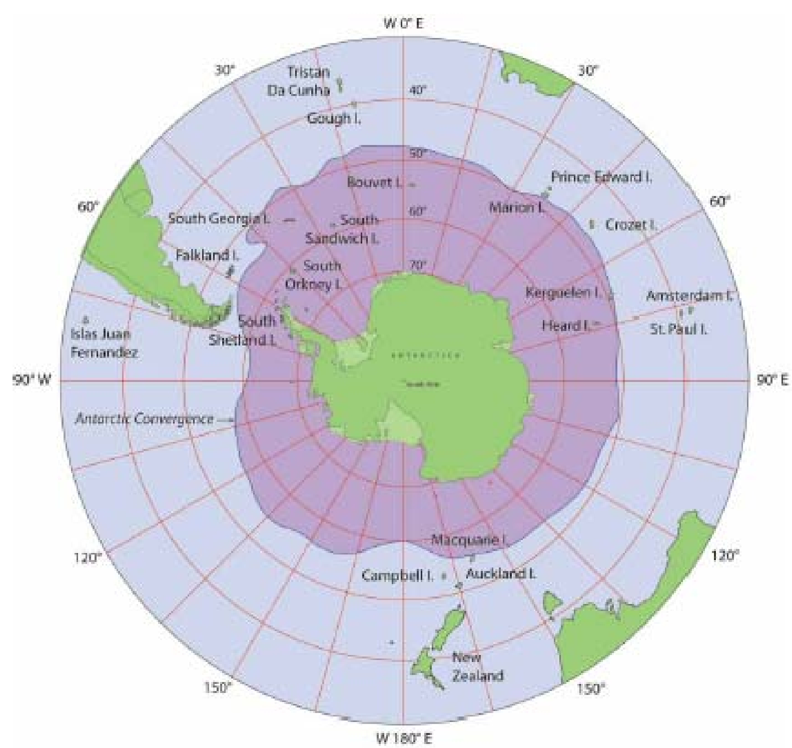


Figure 7. Distribution of the Ross seal.

3.1.d. <u>Life History and Status of Species</u> -- Seabirds

The life history and status of the seabird species that are known to occur in waters managed by parties to CCAMLR and that have the potential to interact with fishing vessels are described in this section. Human and natural impacts on each species are mentioned. Other baseline conditions of seabirds pertinent to CCAMLR waters, specifically direct mortality from incidental take in regulated fisheries and indirect and cumulative impacts associated with fishing, are discussed in Sec. 3.4.b.

Seabirds found in the CCAMLR Convention Area are listed in Table 7. The list is meant to be representative, not comprehensive. Life history and status of the species occurring in CCAMLR waters with the potential for interaction with fishing vessels are described below by taxonomic order. Their status by U.S. law and as defined by the World Conservation Union (IUCN) is provided in Table 7. The CCAMLR Ad hoc Working Group on Incidental Mortality Associated with Fishing (WG-IMAF) identified 20 species of seabirds that were most at risk from longline fisheries in the Convention Area. These 20 species are numbered in Table 7 and discussed in detail. One species of seabird is listed under the U.S. Endangered Species Act, the Amsterdam albatross (*Diomedea amsterdamensis*), which nests on Amsterdam Island, just beyond the Indian Ocean sector of the CCAMLR Convention Area. This species is reviewed more extensively than the others.

Procellariiforms (albatrosses, petrels, and shearwaters):

Most Procellariiformes are characterized by delayed initial breeding, long life span (in some cases over 50 years), strong nest site fidelity, and broad foraging ranges. They nest primarily on islands, but in a variety of habitats. For example, petrels and prions tend to nest in burrows in forest, on the ground under scrub, or in tufted grassy vegetation, while albatrosses almost all nest on the ground or in grasses (West and Nilsson 1994; Nelson 1979).

Albatrosses most often eat cephalopods, fish and crustaceans in varying proportions (Cherel and Klages 1998). Storm petrels and prions primarily eat plankton, though some also eat euphasids (Nelson 1979). The Greybacked storm petrel primarily eats the cypris larvae of the stalked barnacle, *Lepas australis* (Klages *et al*. 1996). Shearwaters are often crepuscular or nocturnal feeders, and are capable of pursuit diving for fish, squid, and crustaceans (Nelson 1979).

Most Procellariiformes are annual breeders, though some are biennial breeders; they lay a single egg each breeding season (Nelson 1979). Generally Procellariiformes are monogamous and have low productivity (BirdLife International 2003).

Procellariiformes are particularly sensitive to mortality from fishing because of their low reproductive rate, high survival, and delayed maturity (Bartle 1990). In addition, the disproportionate mortality of female Grey petrels and Snowy (i.e., wandering) albatrosses observed in longline tuna fishing is of concern (Bartle 1990; Weimerskirch *et al*. 1987). Albatrosses and petrels are the most commonly observed birds around trawl fishing vessels (Petyt 1995). *Procellaria spp*. have primarily been observed foraging over the slope edge (250-780m), and have been found to congregate within 20 km of trawl fishing vessels off the coast of New Zealand (Freeman 1997). Many of the other Procellariiformes are smaller and less aggressive than albatrosses, making the fish or bait less accessible (either through size exclusion or by being out competed by larger birds). Shearwaters are susceptible to incidental catch in near-shore set nets (Taylor 2000). Nocturnal petrels, disoriented by lighted ships, have been killed by crashing into fishing vessels or becoming trapped in them (Taylor 2000). Fishing boats have altered some Procellariiformes foraging patterns (Petyt 1995 and refs therein). The critically endangered (per IUCN categorization) Chatham Island taiko (*Pterodroma magentae*) breeds only on Chatham Island, the greatest risk is probably the abundant mammalian predators on the island (cats, rats, etc.; Imber *et al*. 1994), although it is possible that the taiko could have fisheries interactions.

Charadriiformes (gulls, terns, skuas, jaegers, and sheathbills):

Charadriiformes are a diverse family, including small, plunge-diving terns and large, parasitic skuas. They nest in a variety of habitats, primarily on islands.

Charadriiformes are generally monogamous breeders, and pairs that stay together tend to have higher productivity than those that change mates (Furness and Monagham 1987). They usually delay breeding until they are several years old, and lay one to a few eggs per clutch (Furness and Monagham 1987). While most Chardriiformes are exclusively pair breeders, skuas are cooperative breeders. Skuas build a nest on open ground, and breeding pairs or groups defend territories that are generally retained among years; they raise 1 or 2 chicks (Young 1994).

Terns generally eat small fish and squid (Nelson 1979). The Antarctic tern (Sterna vittata) has been observed foraging on land for krill stranded in an ebbing tide (Favero 1996a). Skuas commonly eat burrowing petrels breeding on the same islands (Young 1994). Sheathbills forage among and kleptoparasitize seabirds, most often penguins, but also Imperial cormorants (*Phalacrocorax atriceps*), and opportunistically eat small vertebrates, algae and invertebrates (Favero 1996b; Jouventin *et al*. 1996).

Compared to Procellariiformes, Charadriiformes are seldom seen from trawl fishing vessels (Petyt 1995). However, gulls, terns, jaegers, and skuas may be affected by prey reduction, and the Antarctic skua has been caught on longline fishing vessels in CCAMLR waters (see Table 21). Gulls are also caught by recreational fishers (Taylor 2000). Sheathbills (Chionidae), a Charadriiform family endemic to Antarctica, do not forage over open water, and so would likely only face indirect effects from fishing related marine debris washing ashore; they could be affected by marine debris as they intercept other seabird food boluses and forage on available food and debris (Jouventin *et al*. 1996). Terns have been caught in seine fishing off Australia (Norman 2000). Gulls have been found entangled or hooked in Australia (Norman 2000).

Sphenisciformes (penguins):

Penguins breed on islands and the mainland in the Antarctic and subantarctic waters managed by CCAMLR. Some penguins nest in burrows (e.g., *Eudyptula spp*.), others nests on land, usually on rocks or vegetation (West and Nilsson 1994; Davis and Darby 1990).

While most penguins lay two eggs, they usually only raise one chick (Taylor 2000). Some penguins are migratory (e.g., Adélie and Chinstrap penguins), while others are sedentary (e.g., Gentoo and Yellow-eyed) (Trivelpiece and Trivelpiece 1990). Some species retain the same mate inter-annually (e.g., Gentoo penguins), while others are less faithful to their mate than most other seabird species (e.g., Adélie) (Trivelpiece and Trivelpiece 1990). As with most long-lived seabirds, Adélie penguin populations are more sensitive to adult survival than other reproductive parameters (Clarke *et al*. 2003).

Penguins forage for fish and their larvae, squid, and crustaceans while swimming underwater; some species are capable of reaching depths of several hundred meters during foraging trips (Nelson 1979).

Penguins are susceptible to incidental mortality associated with capture in near shore set nets, and substantial mortality has been attributed to commercial and recreational gill netting (Taylor 2000; Darby and Dawson 2000; Norman 2000). While penguins are not often caught by longline fisheries, they are occasionally observed with injuries associated with fishing gear (lines or hooks), and have also been caught in lobster pots (Brothers *et al*. 1999; Norman 2000). A crested penguin was observed attending a trawl vessel (Petyt 1995). Indirect effects of prey reduction may also impact penguins (Crawford in press and in WG-EMM-04/28). For example, the African penguin (*Spheniscus demersus*) has been subject to population declines due to lack of prey caused by fishery pressure (Crawford *in press* and in WG-EMM-04/28). While Adélie penguins in some locations are increasing in numbers, extensive krill fishing or environmentally induced prey depletion could reverse this trend (Clarke *et al*. 2003).

Pelecaniformes (cormorants and shags):

Pelecaniformes species in the CCAMLR area breed on islands more than 1 km from shore, near the high tide line on the rocks or in trees. Imperial cormorants (*Phalacrocorax atriceps*) nest at least 100 m from shrub vegetation on nests constructed of algae, guano, feathers, sticks, and shells (Punta *et al*. 2003).

Preferred food items of the Imperial cormorant include small fish, crustaceans, and polychaetes (Punta *et al*. 1993).

Pelecaniformes are susceptible to incidental catch in near shore set nets (Taylor 2000; Norman 2000). Few cormorants were observed in New Zealand trawl fisheries, and none were observed away from Stewart Island (Petyt 1995). Cormorants are rarely caught by longline fisheries, but have been caught in nets (Brothers *et al*. 1999; Norman 2000). As with other seabirds (Monaghan *et al*. 1994), Pelecaniformes could be susceptible to effects from prey reduction.

Specific Species Descriptions

Numbering corresponds to Table 7: "Bird species found in the area managed by CCAMLR parties and their conservation status as defined by the US, CCAMLR and IUCN."

1. Amsterdam albatross (*Diomedea amsterdamensis*)

The Amsterdam albatross (*Diomedea amsterdamensis*) was listed under the ESA in 1995 (60 FR 2899, January 12, 1995). No critical habitat has been designated. This species is listed as critically endangered by the International Union of the Conservation of Nature (IUCN, also known as the World Conservation Union) and it was listed as an endangered migratory species by the Convention for Migratory Species (CMS or Bonn Convention) in 1997 when it was placed under the CMS's Appendix 1. It is one of the most rare bird species in the world.

A small population of this albatross was discovered on Amsterdam Island (37º50' S, 77º31' E) and was described in 1983 as a new species (Jouventin *et al*. 1989). It had formerly been considered a taxonomic subspecies of the wandering albatross (*Diomedea exulans*). The timing of the Amsterdam albatross breeding cycle and its coloration–black line on edge of upper mandible, dark patch on tip of bill, adult brown plumage and dark cap–differ from all of the other known populations of great albatrosses (Jouventin 1994). This species consists of a single population nesting in 400 hectares of the upland plateau of Amsterdam Island in the southeast Indian Ocean. Amsterdam Island is one of the most isolated islands of the world, being located between Australia, Africa and Antarctica at greater than 3,000 km away from any continent. Amsterdam Island is an external territory of France.

Like other Procellariiformes, the Amsterdam albatross is a large bodied, very long-lived species (mean life expectancy of 30 to 40 years), has low fecundity (biennial breeder, laying a single egg at most every 2 years and a chick fledges after about 235 days), and very high adult annual survival. These birds typically start breeding at age 7 (Jouventin *et al* 1989, Weimerskirch *et al*. 1997). The breeding cycle begins with males arriving on the breeding ground from the end of January to mid-February, females arrive approximately 10 days later, eggs are laid mid-February to March, eggs hatch in early May after an approximate 80 day incubation period, and chicks fledge the following January or February (Jouventin *et al*. 1989).

The current population is estimated at 130 birds, including 80 mature individuals with about 18 to 25 breeding pairs (BirdLife International 2003). Although the population has steadily increased since the mid 1980s, its low numbers and low reproductive potential are a cause of concern (Inchausti and Weimerskirch 2001, Weimerskirch and Jouventin

1998). Although the population is still increasing, breeding success has been declining during recent years (Weimerskirch, pers. comm.), possibly caused by disease, which is known to affect nearby breeding yellow-nosed albatrosses on Amsterdam Island (Weimerskirch 2003).

In 1992, probably 75-80% of all Amsterdam albatrosses were banded. Since the mid-1990s, almost every Amsterdam albatross is banded (Weimerskirch, pers. comm.). Little is known about the diet of the Amsterdam albatross but it probably consists of fish, squid and crustaceans (BirdLife International 2003). Given the location of Amsterdam Island near the Subtropical Front, it can be expected that histoteuthids (a squid family) are an important food of the Amsterdam albatross (Cherel and Klages 1997) and foraging is restricted to sub-tropical waters (Inchausti and Weimerskirch 2001), up to 2,200 km away from the breeding colony (Weimerskirch, unpublished data). Limited information on this species' foraging distribution is available from a satellite tracking study conducted on seven birds during the breeding season (incubation phase) in 1996. Satellite fixes from these birds indicate a range extending from about 50º E to 80º E and about 32º S to 45º S (Inchausti and Weimerskirch 2001).

The CCAMLR database contains observer data and commercial data (submitted by vessel operators). The observer data go back to 1995-96 and the commercial data back to 1987 for longline. The CCAMLR database (both longline and trawl gear and observer and commercial data) was queried for the occurrence of records of caught Amsterdam albatrosses (alive or dead). No reports were made of an Amsterdam albatross being caught on fishing gear or of being observed from a fishing vessel (Appleyard, CCAMLR Data Officer, pers. comm. email to Kim Rivera).

Since virtually every Amsterdam albatross is banded (Weimerskirch pers. comm. email), and observers are required to retrieve any bands on incidentally caught birds, identification of these caught specimens could be easily undertaken.

The assessment to consider risk of vessel interaction in CCAMLR areas to the Amsterdam albatross was conducted in 1997 and 1998. Using a coarse scale map of the known foraging range (Croxall 1998), a precautionary interpretation was taken that Amsterdam albatrosses could just occur within the CCAMLR Convention Area boundaries in Divisions 58.5.1 and 58.5.2 (Croxall, pers. comm.). No other subareas or divisions were determined to represent a risk of vessel interaction with the Amsterdam albatross.

It should be noted that the only actual documented and known visits of an Amsterdam albatross occur on the northern border of Division 58.5.1 (see discussion below). No documented observations of an Amsterdam albatross have occurred in Division 58.5.2. Further, the risk assessment notes that the Amsterdam albatross is "breeding species known to visit this area." This species breeds only on Amsterdam Island, which is outside of the Convention Area. The Amsterdam albatross is limited to sub-tropical waters, and is unlikely to interact with toothfish vessels in CCAMLR waters (Inchausti and Weimerskirch 2001)

Except for limited fishing allowed for toothfish for scientific research purposes (in accordance with Conservation Measure 24-01), the taking of toothfish is prohibited in Division 58.5.1 in 2003/04 (Conservation Measure 32-13). There are no conservation measures in place that would allow for fishing of any other species in Division 58.5.1. To date, U.S. vessels have not expressed interest in fishing in either Division 58.5.1 or 58.5.2. However, this may change in the future (Chris Jones, pers comm). Fishing activity in Division 58.5.1 typically occurs within the French EEZ around Kerguelen Island and is managed by the French government. From 1999/2000 to 2001/2002, only French vessels fished in the French EEZ of 58.5.1. Prior to this, vessels from Japan, Russia, Ukraine, and USSR had received licenses from France to fish in its EEZ around Kerguelen Island (Chris Jones, pers. comm.). In addition to being few in number and impact, U.S. vessels fishing in the CCAMLR Convention Area do not overlap with the known foraging range of the Amsterdam albatross.

While the reasons for the present low numbers of the Amsterdam albatross are not well known, the extensive degradation of the island and the impact of longline fisheries operating in the southern Indian Ocean during the 1960s and 1970s have been proposed as possible explanations for its rarity (Inchausti & Weimerskirch 2001). Currently, disease poses the primary threat to the small population (Weimerskirch 2003).

Pelagic longline fisheries for swordfish (*Xiphias gladius*), albacore tuna (*Thunnus alalunjga*), southern bluefin tuna (*T. maccoyii*) occur in sub-tropical waters of the Indian Ocean. These fisheries are fished primarily by the longline fleets of Japan, Taiwan, and Korea (Tuck *et al* 2003). Given the location of Amsterdam Island (37°50' S, 77°31' E) in the Indian Ocean, it is possible that vessels fishing for these species in areas around Amsterdam Island have taken Amsterdam albatrosses. It is possible that the population was already much reduced when longlining started in the central Indian Ocean. However, during the late 1960s and in the 1970s, longline vessels were operating in large numbers over the entire central foraging area, and could have caused mortality of Amsterdam albatrosses especially during the early chick-rearing period, contributing to the decline of the population (Weimerskirch *et al* 1997). To date, there are no verifiable and documented records of incidental take of Amsterdam albatross from longline vessels (Inchausti & Weimerskirch 2001). Although a report of a take from a longliner operating south of Tasmania has been noted (Gales 1998), that record has subsequently been acknowledged as a misidentification (J.P. Croxall, pers. comm., email to Kim Rivera, 12 November 2003). Impacts from fisheries would be greater if fishing was occurring close to the breeding colony (Inchausti and Weimerskirch 2001).

Human predation, habitat degradation (e.g., fires, cattle) and introduction of alien predators are likely sources of direct and indirect impacts on the Amsterdam albatross (Jouventin *et al*. 1989). Since its early discovery (in 1522) and during the subsequent two centuries, Amsterdam Island was frequently visited by sealers, whalers, fishers and other sailors who often reported that they had taken, destroyed or hunted seabirds. Castaways and fishing parties often remained on the island for long periods and lived off the island's fauna. Alien mammals introduced on the island (brown rats, cats, dogs, pigs) have played a major role in depleting the local seabird populations. Additionally, a combination of the expansion the feral cattle population (introduced in 1871) and the occurrence of fires is responsible for habitat degradation and erosion on most of the island, thus preventing seabirds from nesting on more than 70% of it. The current breeding area is confined to a peat bog at the island summit (800 m) but fossil evidence indicates the Amsterdam albatross previously bred down to 300 m altitude (Micol and Jouventin 1995). Cats, rats and cattle are still present and constitute a serious threat for the Amsterdam albatross and its breeding habitat (Jouventin *et al* 1989). A causal link between the expansion in numbers and area occupied by the feral cattle population and the decrease of albatrosses is suspected (Jouventin 1994). Results of systematic surveys for skeletal materials (Jouventin *et al*. 1989) showed that the breeding area of the albatrosses was formerly much larger, and extended over parts of the island where cattle now occur. As early as 1984, scientists proposed that the breeding area (400 ha) be completely protected from disturbance by humans and fenced off to exclude the feral cattle (Jouventin *et al*. 1984).

The threat of the albatross being trampled by cattle is being reduced by the construction of a fence to prevent access to the breeding area (Gales 1993). Additionally, during March and April 1988, the cattle population was reduced in size by almost 50% through the removal of 932 cows (Jouventin 1994). Access by humans to the colony is under strict control to minimize disturbance.

Infectious diseases have the potential to cause rapid decline and extinction in vertebrate populations. Two diseases (worldwide spreading avian cholera and *Erysipelothrix rhusiopathidae*) have been identified as impacting the population of yellow-nosed albatross on Amsterdam Island (Weimerskirch 2004). The diseases are affecting mainly chicks during their first weeks of life with a cyclic pattern between years, but adult birds have also been found dead on the colonies. The outbreak of the disease occurred probably in the mid 1980s when the population started to crash at the same time that chick mortality increased and adult survival declined. These diseases are considered to be the primary threat facing the current Amsterdam albatross population (Weimerskirch 2004, BirdLife International 2003).

2. Antipodean albatross (*Diomedea antipodensis*)

The IUCN listed the Antipodean albatross as Vulnerable because of its limited breeding range. Breeding only occurs on Antipodes Island, Campbell Island, and the Auckland Islands on New Zealand (Birdlife International 2003). Satellite tracked birds revealed that they preferentially forage over deep water at or beyond the edge of the continental shelf, favoring water greater than 2000 m deep (Nicholls *et al*. 2002). Antipodean albatrosses consume histoteuthids, onychoteuthids, and cephalopods (Imber 1999).

Breeding occurs biennially, though birds that fail to fledge young may breed the following year. Population is approximately 17,000 individuals, with 5,150 breeding pairs (Robertson and Gales 1998). Average productivity between 1991 and 1996 was estimated to be 69% on Adams Island in the Auckland Islands (Croxall and Gales 1998).

Threats facing the Antipodean albatross include interactions with longline fisheries throughout their foraging area, and invasive species (pigs and feral cats) on the Auckland Islands (Croxall and Gales 1998). Documented catches of longline vessels were described in Murray *et al*. 1993.

3. Southern royal albatross (*Diomedea epomorphora*)

Southern royal albatrosses only breed on Campbell Island, Enderby Island, Adams Island, and Auckland Island, although more than 99% of pairs breed on Campbell Island (Gales 1998). Global population has been estimated at 7,870 pairs breeding annually (approximately 13,000 total breeding pairs), and 50,000 individuals (Gales 1998). This species was listed as Vulnerable by the IUCN because of its small range (Birdlife International 2003).

Breeding occurs biennially, except in the case of nest failure (Gales 1998). Eggs are laid in sheltered areas on flat ground (Birdlife International 2003). Foraging by breeding adults is limited to the continental shelf and shelf edge within 1250 km of the breeding island (Waugh *et al*. 2002). Foraging during the non-breeding season can extend throughout the southern oceans (Croxall and Gales 1998).

Southern royal albatrosses were killed in trawl fisheries prior to removal of netsonde monitor cables, and are susceptible to capture from longline fishing throughout the southern oceans due to their broad foraging area when not breeding (Bartle 1991, Gales 1998). Mammalian predators are an ongoing threat on Campbell and Auckland Islands (cats, pigs, and rats; Birdlife International 2003). Vegetation changes on Campbell Island may also have affected breeding habitat (Birdlife International 2003).

4. Wandering Albatross (*Diomedea exulans*)

The IUCN has listed the Wandering albatross as vulnerable because the overall population is declining at a rate of over 30% in 70 years, although some populations are declining faster, and others remain stable (Birdlife International 2003). Total population is approximately 28,000 individuals, with around 8,500 breeding pairs (Croxall and Gales 1998). An average population increase of 0.43% per year between 1984 and 2000 was attributed to recovery from a population low in the mid-1980s (Nel *et al*. 2003). However, an 83% decrease of foraging Wandering albatrosses between 1980-1981 and 1997-1998 was noted in Prydz Bay, East Antarctica (Woehler and Watts 2000).

Marion and Prince Edward Islands in the Indian Ocean contain approximately 44% of the world's breeding population of Wandering albatrosses. A long term study at Marion Island found that 87% of birds that fledged a chick waited a full year before attempting to breed, while 81% of birds that failed to fledge a chick breed the next year (Nel *et al*. 2003). The average age of first breeding was 10 years, and breeding success was highest in the 10-25 year age classes. Following loss of a mate, male birds took approximately 4 years to find a new mate, while females took 3 years (Nel *et al*. 2003). Foraging occurs primarily over waters greater than 2,000 meters deep, and preferred food items include histoteuthids, onychoteuthids, and cephalopods (Nicholls *et al*. 2002, Imber 1999).

Longline fishing appears to have mixed impacts on wandering albatrosses. While the discharge of offal from longline vessels provides an additional food source for the birds, large amounts of fisheries related debris, including hooks and rope, are harmful (Nel *et al*. 2003; Huin and Croxall 1996). In a colony of Wandering albatrosses in South Georgia, 20% of food boluses examined contained regurgitated fish hooks (Huin and Croxall 1996). The increased food from the offal is thought to have caused a decrease in age of first breeding since 1997 (Nel *et al*. 2003). Wandering albatross have been caught in the tuna longline fishery off the coast of Brazil and in the Australian EEZ (Neves and Olmos 1998, Gales *et al*. 1998). The Wandering albatross is the most aggressive seabird around longline vessels, making them especially susceptible to accidental hooking (Gales *et al*. 1998). Juvenile males are caught more often than females or adults (Gales *et al*. 1998). Large scale weather patterns may also affect Wandering albatross populations; the El Niño southern oscillation has been correlated with proportion of first time breeders in a colony, possibly due to the changes in food resources related to El Niño effects (Nel *et al*. 2003).

5. Northern royal albatross (*Diomedea sanfordi*)

The Northern royal albatross breeds on the Chatham Islands (44° S, 176°30′ W), South Island of New Zealand (45°46′ S, 170°44′ E), and the Auckland Islands (BirdLife International 2003). Almost all breeding occurs on the Chatham Islands (BirdLife International 2003). Predicted declines of the Northern royal albatross (more than 50% over 84 years), and their restricted breeding range have led to the IUCN classifying it as Endangered (BirdLife International 2003).

Breeding occurs biennially, except in the case of nest failure (Robertson 1998). First breeding generally occurs at 6 years (Robertson 1998). Historically, nests would have been built on vegetation, however, habitat change has lead to egg laying on rocks(BirdLife International 2003). Adult survival is around 95%, juvenile survival to 5 years is around 70% (Robertson 1998).

Northern royal albatrosses forage most often between 30 and 400 km of the coast, and almost exclusively over the shallow waters of the continental shelf and shelf edge (Nicholls *et al*. 2002). Preferred food items include *Mototeuthopsis ingens*, *Pinnoctopus cordiformi, Histioteuthis atlantica*, and *Nototodarus spp*. (Imber 1999).

Average annual productivity fell from 48% in the 1970s to 18% in the 1990s (Robertson 1998). This was apparently due to habitat degradation associated with drier, warmer weather in general and extreme storms in the breeding areas (Robertson 1998).

6. Sooty albatross (*Phoebetria fusca*)

The Sooty albatross has been classified by the IUCN as Endangered due to a 75% rate of decline over 90 years (BirdLife International 2003). Sooty albatrosses breed on the Tristan da Cunha, Gough, Prince Edward, Marion, Kerguelen, Crozet, Amsterdam, and St. Paul Islands (Gales 1998).

Average age at first breeding is 12.7 years (Weimerskirch and Jouventin 1998). Average breeding success between 1966 and 1995 on the French sub-Antarctic Islands was 58%, and juvenile survival to first return to land was 22% (Weimerskirch and Jouventin 1998). Breeding generally occurs once every two years, but failed breeders often attempt again the following year (Marchant and Higgins 1990). In recent decades breeding success has increased, which is expected to slow the population decline (Weimerskirch and Jouventin 1998). Adult survival is near 90% (Weimerskirch and Jouventin 1998).

The high mortality rate of adult Sooty albatrosses has been associated with longline fishing effort in their foraging waters, which include sub-tropical waters of the Indian Ocean, where longline fishing occurs without bycatch observers (Weimerskirch and Jouventin 1998).

7. Light-mantled sooty albatross (*Phoebetria palpebrata*)

Light-mantled sooty albatrosses breed along ridges and inland at Marion Island, Possession Island (46° S, 51° E), South Georgia, Heard and MacDonald Islands, Amsterdam, St. Paul, Crozet, and Kerguelen Islands, Macquarie Island, Auckland, Campbell, and Antipodes Island (Crawford *et al*. 2003, BirdLife International 2003). Pairs breed biennially if they are successful in rearing a chick (Weimerskirch 1987). The population of light-mantled sooty albatrosses on Marion Island is estimated at 192 breeding pairs. The population at Marion Island decreased significantly between 1996-2003, and at Possession Island between 1980 and 1994 (Crawford *et al*. 2003, Weimerskirch and Jouventin 1998).

Annual adult survival between 1966 and 1995 averaged 97.3%, age at first breeding is 12 years on average, and breeding success averages 35.1% (Weimerskirch and Jouventin 1998). Light-mantled sooty albatrosses have nearly the highest adult survival rate and lowest productivity of all albatrosses (Weimerskirch *et al*. 1987).

An 82% decrease of foraging Light-mantled sooty albatrosses between 1980-1981 and 1997-1998 was noted in Prydz Bay, East Antarctica (Woehler and Watts 2000). Decreases in breeding populations have been attributed to mortality associated with longline fishing (Weimerskirch and Jouventin 1998). Light-mantled sooty albatrosses are caught by tuna longline vessels, and are likely caught by toothfish longline vessels (BirdLife International 2003).

8. Buller's albatross (*Thalassarche bulleri*)

The Buller's albatross breeds annually, on only a few islands off of New Zealand, including the Snares (48°02′ S, 166°33′ E) and Solander (46°35′ S, 166°54′ E), the Chatham Islands, and the Three Kings Islands (Birdlife International 2003). Total breeding population in 1996-1997 was estimated at 11,502 pairs (Sagar *et al*. 1999). The population on the Snares increased between 1969 and 1997 (Sagar *et al*. 2000), however, the limited breeding range has led to a listing of the Buller's albatross as Vulnerable by the IUCN (BirdLife International 2003).

Breeding is initiated between December and February and fledging occurs from August to October; incubation and chick rearing are relatively long compared to other albatross species of similar size and breeding regime (Sagar and Warham 1998). Nest mounds are built under *Olearia lyalli* forest, and often used by the same pair for several years (Sagar and Warham 1998). Breeding success was 57% in 1972 (Sagar and Warham 1998). Between 1992 and 1997 adult survival was 0.955, although overall annual survival from 1961 to 1997 was 0.934, because annual survival was lower in the 1960s and 1970s (Sagar *et al*. 2000). Foraging movements outside of breeding season are not well defined, though recent research indicates they forage in South American waters (Sagar and Warham 1998; Spear *et al*. 2003). They were observed feeding in conjunction with small whales (Spear *et al*. 2003). Year-round food preferences are not known, although squid has been found in most food samples from breeding Buller's albatrosses (Sagar and Warham 1998).

Longlining has potential to impact the Buller's albatross population; between 1989 and 1992 the Buller's albatross made up 22% of the total seabird bycatch in Japanese longline tuna fishing in New Zealand waters (Murray *et al*. 1993). Buller's albatrosses have been caught in both trawl and longline fisheries off New Zealand (Sagar *et al*. 2000), and were found foraging off fishing vessels in South American waters (Spear *et al*. 2003). Reduced adult survival in the 1960s and 1970s has been attributed to higher fishing effort in the foraging waters of the Buller's albatross during that time (Sagar *et al*. 2000).

9. Indian yellow-nosed albatross (*Thalassarche carteri*)

The IUCN has listed the Indian yellow-nosed albatross as endangered due to the projected rapid decline of the largest breeding colony associated with disease and incidental mortality from fishing (Birdlife International 2003). Breeding occurs annually, breeding is limited to Prince Edward Island, Crozet Islands, Kerguelen Islands, Amsterdam Island, and St. Paul Island (Weimerskirch *et al*. 1987, BirdLife International 2003). Approximately 70% of the global population of this species nests on Amsterdam Island, where the population has declined at least 36% since 1984 (Gales 1998, Weimerskirch and Jouventin 1998). The predicted rate of decline after 1995 was 7% per year (Weimerskirch and Jouventin 1998).

Adult annual survival averages 85.7% and average breeding success is 24.5%. Average age of initial breeding is 8.7 years (Weimerskirch and Jouventin 1998). Survival of adults and juveniles declined almost 10% from the early 1980s to the mid

1990s (Weimerskirch and Jouventin 1998).

High mortality of Indian yellow-nosed albatross chicks on Amsterdam Island has been associated with illness from bacterial infections, including avian cholera (Weimerskirch 2004). Large numbers of Indian yellow-nosed albatrosses are caught in tuna longline fisheries while wintering over Australasian waters (Weimerskirch and Jouventin 1998).

10. Atlantic Yellow-nosed albatross (*Thalassarche chlororhynchos*)

The Yellow-nosed albatross has been listed by the IUCN as endangered, due to a 58% decline in study populations predicted over 72 years (Birdlife International 2003). The population is estimated between 50,000 and 99,000 individuals with 21,600-35,600 breeding pairs, though population modeling predicts an annual decrease of 1.5-5.5%, depending on location (Birdlife International 2003, Cuthbert *et al*. 2003).

It breeds annually in nests on grass, rocks or under trees, on islands in the Tristan da Cunha archipelago and on Gough Island. Average breeding success is 67-69%. First year breeders are on average 9.7 years old (Cuthbert *et al*. 2003). Adult annual survival varies between 84 and 88%, depending on location; juvenile survival averages 31% (Cuthbert *et al*. 2003). Adult survival of Tristan Island birds has been correlated with longline fishing effort in the vicinity (Cuthbert *et al*. 2003).

Longline fishing off Brazil is viewed as the greatest threat to the Yellow-nosed albatross currently, with more than 900 birds killed yearly (Olmos *et al* 1997). The Yellow-nosed albatross is also known to attend trawlers and tuna longliners off southern Africa (Olmos *et al*. 1997). Mortality from oiling is occasionally observed off the coast of Uruguay (Stagi *et al.* 1998).

11. Grey-headed albatross (*Thalassarche chysostoma*)

The IUCN classifies the Grey-headed albatross as Vulnerable because of an estimated overall decline of approximately 48% over 90 years (BirdLife International 2003).

Breeding occurs in South Georgia, Diego and Ramirez Islands, Kerguelen and Crozet Islands, Marion and Prince Edwards Islands, Campbell Island, and Macquarie Island (Gales 1998). Eggs are laid in October, chicks fledge the following April or May (Gales 1998). Average age at first breeding is 13.5 years (Waugh *et al*. 1999). Grey-headed albatrosses breed biennially, and in some cases less often, although birds that have nest failures during incubation often breed the following year (Prince *et al*. 1994). Breeding success between 1984 and 1996 averaged 40%, and juvenile survival averaged 24% (Waugh *et al*. 1999).

Preferred food items are cephalopods and crustaceans; the presence of the oceanic cephalopod, *Martialia hyadesi* (squid), is positively correlated with breeding success (Xavier *et al*. 2003).

The declining population of Grey-headed albatrosses has been attributed to mortality on longline fisheries (BirdLife International 2003).

12. Salvin's albatross (*Thalassarche salvini*)

The Salvin's albatross breeds primarily on the Bounty Islands; some nests have also been found on the Snares and Chatham Islands, New Zealand, and on the Crozet Islands (BirdLife International 2003). Its restricted breeding range and limited information on population status have led to its listing as vulnerable by the IUCN (BirdLife International 2003).

Breeding occurs on small, bare rocky islands (Croxall and Gales 1998). The Salvin's albatross makes broad movements throughout the South Pacific ocean (Taylor 2000; Spear *et al*. 2003). It forages almost exclusively over the continental shelf, within 250 km of the coastline (Spear *et al*. 2003). Adults are found off the coast of South America primarily in the autumn, and non-breeders are found there more often in the spring (Spear *et al*. 2003).

The Salvin's albatross breeds on islands that are vulnerable to extreme weather events. Longline fishing in New Zealand waters and elsewhere may pose a threat to the birds (BirdLife International 2003). They have been observed foraging in association with toothfish vessels off the coast of Chile (Spear *et al*. 2003).

13. Chatham albatross (*Thalassarche eremita*)

This species is classified as Critically Endangered by the IUCN (Birdlife International 2003). The Chatham albatross breeds only on The Pyramid formation in the Chatham Islands, in the Pacific Ocean between Australia and South America. The population is estimated at 5,300 pairs; population trends have not been determined.

The Chatham albatross is medium sized. Breeding is likely initiated in August-September, with fledging occurring in February-April (Robertson *et al*. 2000). Breeding success is estimated at 50-65% per year, and lower in years of extreme weather (Robertson *et al*. 2003b). Age at first breeding is not known, but birds followed to 6 years of age had not yet attempted to breed (Robertson *et al*. 2000). Time between breeding seasons is spent near Chile and Peru, north to 68° (Robertson *et al*. 2000, Birdlife International 2003). Foraging has been observed within 300 km over the shelf edge and from 1,000-4,500 m (Robertson *et al*. 2000). During non-breeding season, Chatham albatrosses have been observed off the west coast of South America, primarily over pelagic waters in the autumn and over the continental shelf in the spring (Spear *et al*. 2003). Chatham albatrosses have also been observed over Australian waters (Reid and James 1997).

The Chatham albatross is vulnerable due to habitat loss, mortality from interactions with fishing vessels, and possible annual harvest of chicks (Robertson *et al*. 2000). Their nesting island has been subject to damage from extreme weather, resulting in vegetation and soil losses. At least 13 individuals have been confirmed caught by fishing vessels, including a tuna longliner, demersal longliners, and coastal longliners.

14. Campbell albatross (*Thalassarche impavida*)

The Campbell albatross breeds only in the Campbell Islands and a small Island off New Zealand, Jeanette Marie (Taylor 2000; BirdLife International 2003). The IUCN has classified the Campbell albatross as Vulnerable because of its restricted breeding range (BirdLife International 2003). The population declined greatly in the 1970s and 1980s, but is now thought to be slowly increasing (Waugh *et al*. 1999)

Breeding adults forage in waters around Australia, New Zealand, and near the Ross Sea, and outside of breeding season they forage near South America (Waugh *et al*. 1999).

The Campbell albatross nests on grassy ledges and slopes (BirdLife International 2003). Breeding success averaged 66% between 1984 and 1996 (Waugh *et al*. 1999). Annual adult survival averaged 94.5% between 1984 and 1995; average age of first breeding is around 10 years (Waugh *et al*. 1999).

Tuna longline vessels often report bycatch of Campbell albatrosses, and they are occassionally caught by trawl fisheries (Taylor 2000; Murray 1993; Gales et al. 1998). Mortality due to tuna longline bycatch has been implicated as the most likely cause of the population decline of the Campbell albatross seen in the 1970s and 1980s (Taylor 2000). Other threats include predators, such as brown skuas, and the potential for diseases that have been found in other birds on the islands, such as avian cholera and avian malaria (Taylor 2000).

15. Black-browed albatross (*Thalassarche melanophrys*)

This species has been upgraded to Endangered on the IUCN Redlist (Birdlife International 2003). The population has declined approximately 65% in the past 65 years, with greatest declines occurring at the most important breeding sites (Birdlife International 2003).

The Black-browed albatross is primarily found in the southwest Atlantic and southeast Pacific oceans, with approximately half the population breeding the Falkland Islands (Malvinas), 20% breeding on Chilean Islands (Robertson *et al*. 2003b), and the remainder breeding on South Georgia, Crozet and Kerguelen Islands, Heard and McDonald Islands, Macquarie Island, Campbell, Antipodes, and Snares Islands (Croxall and Gales 1998).

Nests are constructed on grassy slopes and along the shore. Annual breeding generally occurs between September and April (Robertson and Gales 1998). Adult survival has been estimated at 91-93% (Weimerskirch and Jouventin 1998, Prince *et al*. 1994). Age at first breeding averages 10 years. Breeding success is approximately 63%

(Prince et al. 1994). Juvenile survival averages 14-29% (Weimerskirch and Jouventin 1998, Waugh et al. 1999).

Preferred food items of Black-browed albatrosses breeding in South Georgia include the icefish, *Champsocephalus gunnari*, and Antarctic kill, *Euphausia superba*; the presence of icefish in the diet is positively correlated with breeding success (Xavier *et al*. 2003).

Birds breeding on the Falkland Islands and elsewhere forage almost exclusively over the continental shelf, making them vulnerable to interactions with fishing vessels (Huin 2002). Black-browed albatrosses are one of the most commonly caught birds by longline fisheries, and their recent population decline may largely be due to their mortality as bycatch (Birdlife International 2003). They have been cited as the albatross at greatest risk from fishing mortality (Weimerskirch and Jouventin 1998). Their broad geographic distribution puts them in contact with longline fishing off Australia, Africa, South Georgia, Brazil, and Chile (Robertson and Gales 1998; Neves and Olmos 1998). Observations on a fishing vessel off the coast of Uruguay which was not using weighted swivels resulted in a catch rate of 481 albatross per 1,000 hooks set; adding weights to the swivels reduced the catch rate to 4.7 albatross per 1,000 hooks set, in both cases Black-browed albatrosses made up the bulk of the birds (Stagi *et al*. 1998). Longline fishing related debris has been found in food samples, including fishing line and the tip of a fishing hook (Xavier *et al*. 2003). Mortality from oiling is occasionally observed off the coast of Uruguay (Stagi *et al*. 1998).

16. White-capped albatross (*Thalassarche steadi*)

The White-capped albatross is closely related to the Shy albatross (*T. cauta*). While some evidence exists to suggest they are separate species, the separation of the two species has been controversial (Abbot and Double 2003, Double *et al*. 2003). For the purpose of this document they are treated as a separate species because they were listed by CCAMLR as a separate species at risk from fisheries interactions. Total breeding pairs are estimated between 65,000 and 80,000, and may be increasing (Taylor 2000; Baker *et al*. 2002). Breeding occurs on islands in the south of New Zealand, including the Auckland, Disappointment, Chatham, and Antipodes Islands (BirdLife International 2003; Robertson *et al*. 1997).

Egg laying is initiated in mid-November (Gales 1998). During the breeding season, adults remain near breeding islands, though dispersal outside breeding season is not well known (Taylor 2000).

The White-capped albatross is frequently caught by tuna longliners, comprising a large portion of seabirds killed on tuna longline and squid trawl vessels in New Zealand waters in 1988-1997 (Taylor 2000). White-capped albatrosses were the most commonly caught bird on squid trawls in New Zealand in 1990, with a catch rate of approximately 0.263 birds per tow, with over 80% of the mortality due to interactions with the netsonde cables (now banned in New Zealand; Bartle 1991). Other threats include feral animals (pigs and cats), and possibly disease (Taylor 2000). Changes in food availability from commercial fishing (offal availability) and climate change may also affect the White-capped albatross in the future (Taylor 2000; BirdLife International 2003).

17. Southern giant petrel (*Macronectes giganteus*)

The overall population of the Southern giant petrel has declined at a rate of 20% over 60 years, leading to its listing as Vulnerable by the IUCN (BirdLife International 2003). Human disturbance is believed to be responsible for more than 90% declines in the breeding population of the Southern giant petrel at some colonies (Woehler *et al*. 2001).

The Southern giant petrel breeds on Islands off Chile and Argentina, the Falkland Islands (Malvinas), South Georgia, South Sandwich Islands, South Orkney and South Shetland Islands, Gough Island, Prince Edward Islands, Crozet and Kerguelen Islands, Heard and McDonald Islands, Macquarie Island, and on the Antarctic Peninsula and continent (BirdLife International 2003). Nesting occurs on grass or bare ground. Outside of the breeding season adults and juveniles disperse broadly (BirdLife International 2003; Hunter 1984). First breeding generally occurs between 6 and 9 years, and adult survival averages 90% (Hunter 1984).

Analysis of stomach contents has revealed a diet of penguins, petrels, cormorants, seal carrion, cephalopods, crustaceans, and fish (Punta and Herrera 1995).

Significant mortality associated with illegal or unregulated longline fishing has been inferred (see CCAMLR 1997, 1998). Prey availability, human disturbance and persecution are also threats (BirdLife International 2003; Woehler *et al*. 2001). Recently, a Southern giant petrel was found dead due to avian cholera (Leotta *et al*. 2003). A study of petrel chick stomach contents found marine debris in 73% of samples, primarily consisting of plastics and other items attributed to trawl fishing vessels (Copello and Quintana 2003.

18. Northern giant petrel (*Macronectes halli*)

The population trend of the Northern giant petrel is unknown, although believed to be stable (Taylor 2000). However, a 99% decrease of foraging Northern giant petrels between 1980-1981 and 1997-1998 was noted in Prydz Bay, East Antarctica (Woehler and Watts 2000).

The Northern giant petrel breeds at South Georgia, Prince Edward, Crozet, Kerguelen, Macquarie, Auckland, Campbell, Antipodes, and Chatham islands, and on islets off Stewart Island (Taylor 2000). Breeding success averages 25%, other reproductive parameters are unknown (Robertson *et al*. 2003b). Foraging outside of breeding season occurs throughout the southern ocean, between 30° S and 64° S (Taylor 2000).

The Northern giant petrel's less colonial breeding habit makes it less sensitive to human disturbance than the threatened Southern Giant-petrel, although it has been observed abandoning nests when handled or approached by humans (Taylor 2000). Introduced species (cats, pigs) and skuas pose a minor threat to eggs and chicks (Taylor 2000). Longline fishing for *Dissostichus eleginoides* in the 1990's to significant bycatch in Northern giant-petrels (CCAMLR 1996-1998). Fishing hooks associated with toothfish fisheries have been found in birds in South Georgia (Huin and Croxall 1996). Northern giant petrels have also been caught by tuna longline vessels, and have been observed attending to trawl vessels, though there are few records of them being caught by trawls (Robertson *et al*. 2003b). Mortality associated with fishing may be exacerbated by loss of habitat due to fur seal range expansion.

19. White-chinned petrel (*Procellaria aequinoctialis*)

This species is classified as Vulnerable because of massive mortality in longline fisheries for toothfish and hake (Birdlife International 2003). The population is expected to decrease substantially in the near future (Birdlife International 2003).

Global population of the White-chinned petrel is estimated at 5 million, with the greatest breeding population on South Georgia (Birdlife International 2003). A recent decline of breeding pairs of approximately 28% at Bird Island in South Georgia has been attributed to longline fishing mortality (Berrow *et al*. 2000). A 95% decrease of foraging White-chinned petrels between 1980-1981 and 1997-1998 was noted in Prydz Bay, East Antarctica (Woehler and Watts 2000).

The White-chinned petrel breeds in colonies throughout the southern ocean, including the Falkland Islands, South Georgia, and the Campbell and Antipodes Islands (Gales *et al*. 1998). Breeding occurs annually, with about 44% success (Berrow *et al* 2000). Food items include cephalopods, crustaceans, and fish (Birdlife International 2003).

White-chinned petrels make up most of the bycatch of some demersal longline fisheries, and are frequently caught in other longline fisheries (Barnes *et al*. 1997, Gales *et al*. 1998). Unlike most albatrosses, White-chinned petrels are often caught at night, making night-setting of lines a less effective conservation measure for this species (Barnes *et al*. 1997, Gales *et al*. 1998). White-chinned petrel have also been observed colliding with netsonde cables on trawling vessels (Schiavini *et al*. 1998). Other threats include predation by rats at South Georgia, and habitat degradation by Antarctic fur seals (*Arctocephalus gazella*; Berrow *et al*. 2000).

20. Grey petrel (*Procellaria cinerea*)

The majority of Grey petrels breed on Gough and other islands in the Tristan da Cunha group; significant breeding populations also occur on Prince Edward and Marion islands, Crozet, Kerguelen and Amsterdam islands, and Campbell and the Antipodes islands (Zotier 1990; BirdLife International 2003).

Breeding occurs annually during the winter, with nest initiation occurring in February (Chastel 1995; Zotier 1990). While egg laying is synchronous, fledging is asynchronous, with chicks fledging from September through October, probably due difficulty obtaining enough food during the subantarctic winter (Zotier 1990). Nest burrows are built in steep, well drained, grassy areas (Bell 2002).

The Grey petrel is often killed by the tuna-longline fishery in New Zealand waters and elsewhere (Bartle 1990; BirdLife International 2003). Introduced predators on the breeding islands are also a serious threat (cats, rats, and Weka [*Gallirallus australis*]), having already been implicated in extinction of breeding populations on some islands (BirdLife International 2003). Although there are no current trend data for this species, it has clearly suffered a historic decline at least, and could be undergoing a serious reduction owing to interactions with fisheries and predation on its breeding islands. Females are disproportionately killed on longline fishing vessels, probably due to the species' sexual segregation during non-breeding season (Bartle 1990).

Table 7 (Sec. 3.1.d.): Bird species found in the area managed by CCAMLR parties and their conservation status as defined by the US, CCAMLR and IUCN. (naming follows IUCN where applicable)

#	Species Name	English Name	Global Population Estimate (breeding pairs)	Reference	U.S. Status	CCAMLR and IUCN Status (SC-CCAMLR-XXII/BG/18 and Redlist)*	CCAMLR Areas (SC-CCAMLR-XXII/ BG/17)
	Procellariiformes						
	Diomedidae	Albatrosses					
1	*Diomedea amsterdamensis*	Amsterdam albatross	18-25	Inchausti and Weimerskirch 2001, Birdlife International 2003	Endangered	Critically Endangered	No data
2	*Diomedea antipodensis*	Antipodean (wandering) albatross	5,150	Robertson and Gales 1998		Vulnerable*	88.1
3	*Diomedea epomophora*	Southern royal albatross	13,000	Gales 1998		Vulnerable*	58.5, 58.6, 58.7
4	*Diomedea exulans*	Wandering albatross	8,500	Croxall and Gales 1998		Vulnerable*	All, only N part of 88.1
	Diomedea gibsoni	Gibson's albatross	5,800	Walker and Elliott 1999			
5	*Diomedea sanfordi*	Northern royal albatross	5,200	Baker *et al.* 2002		Endangered*	58.5, 58.6, 58.7
6	*Phoebetria fusca*	Sooty albatross	15,655	Gales 1998		Endangered*	58.6, 58.7, 58.4.1, 58.4.4
7	*Phoebetria palpebrata*	Light-mantled (sooty) albatross	26,000-130,000	Baker *et al.* 2002		Near-threatened*	All
8	*Thalassarche bulleri (Diomedea bulleri)*	Buller's albatross	11,500	Sagar *et al.* 1999		Vulnerable	
9	*Thalassarche carteri*	Indian yellow-nosed albatross	36,500	Weimerskirch and Jouventin 1998		Endangered*	58.5, 58.7, 58.4.1

#	Species Name	English Name	Global Population Estimate (breeding pairs)	Reference	U.S. Status	CCAMLR and IUCN Status (SC-CCAMLR-XXII/BG/18 and Redlist)*	CCAMLR Areas (SC-CCAMLR-XXII/ BG/17)
	Thalassarche cauta (Diomedea cauta)	Shy albatross	12,200	Gales 1998		*	58.6, 58.7, 58.4.1, 58.4.3, 58.5.1, 58.5.2
10	*Thalassarche chlororhynchos (Diomedea chlororhychos)*	Atlantic Yellow-nosed albatross	21,600-35,600	Robertson and Gales 1998		Endangered*	No data
11	*Thalassarche chrysostoma (Diomedea chrysostoma)*	Grey-headed albatross	82,000	Robertson *et al.* 2003b		Vulnerable*	All, only N part of 48.6
12	*Thalassarche salvini (Diomedea salvini)*	Salvin's albatross	31,000	Taylor 2000		Vulnerable	58.6, 88.1
13	*Thalassarche eremita (Diomedea eremita)*	Chatham albatross	2,500-5,300	Taylor 2000; Robertson *et al.* 2000		Critically Endangered*	88.1
14	*Thalassarche impavida (Diomedea impavida)*	Campbell albatross	19,000-26,000	See Moore 2002; Gales 1998		Vulnerable*	88.1, 58.4.1
15	*Thalassarche melanophyrys (Diomedea melanophyrys)*	Black-browed albatross	615,000	Robertson *et al.* 2003b		Endangered*	All, only NE part of 48.6, 88.1, rare in 58.4.4
16	*Thalassarche steadi*	White-capped albatross	65,000	Baker *et al.* 2002		Near-threatened*	No data
	Procellariidae	Petrels and shearwaters					
	Daption capense	Cape petrel	>100,000	Marchant and Higgins 1990		*	
	Fulmarus glacialoides	Southern fulmar	580,000	Baker *et al.* 2002		(*)	
	Halobaena caerulea	Blue petrel	>600,000	Baker *et al.* 2002			

#	Species Name	English Name	Global Population Estimate (breeding pairs)	Reference	U.S. Status	CCAMLR and IUCN Status (SC-CCAMLR-XXII/BG/18 and Redlist)*	CCAMLR Areas (SC-CCAMLR-XXII/ BG/17)
17	*Macronectes giganteus*	Southern giant petrel	18,750 – 31,000	Baker *et al*. 2002; BirdLife International 2003		Vulnerable*	All
18	*Macronectes halli*	Northern giant petrel	12,000	Baker *et al*. 2002		Near-threatened*	All, only N part of 48.6, 88.1
	Pachyptila crassirostris	Southern fulmar prion	30,000	Taylor 2000			
	Pachyptila desolata	Antarctic prion	25,000,000	Taylor 2000			
	Pachyptila turtur	Southern fairy prion	>1,000,000	Taylor 2000			
	Pagodroma nivea	Snow petrel	>43,000	Baker *et al*. 2002			
19	*Procellaria aequinoctialis*	White-chinned petrel	2,500,000	Marchant and Higgins 1990		Vulnerable*	All, only NE part of 88.1 and extreme N part of 48.6
20	*Procellaria cinerea*	Grey petrel	>50,000	Taylor 2000		Near-threatened*	All, only N part of 48.6, 88.1
	Procellaria conspicillata	Spectacled petrel	2,500-10,000	Ryan and Moloney 2000			
	Procellaria westlanica	Westland petrel	2,000	Taylor 2000			
	Pterodroma inexpectata	Mottled petrel	300,000-400,000	Taylor 2000			
	Pterodroma lessonii	White-headed petrel	>160,000	Baker *et al*. 2002			
	Pterodroma macroptera	Great-winged (Grey-faced) petrel	>940,000	Baker *et al*. 2002			

#	Species Name	English Name	Global Population Estimate (breeding pairs)	Reference	U.S. Status	CCAMLR and IUCN Status (SC-CCAMLR-XXII/BG/18 and Redlist)*	CCAMLR Areas (SC-CCAMLR-XXII/ BG/17)
	Pterodroma magentae	Chatham Island taiko	4	Crockett 1994; Imber *et al.* 1994		Critically Endangered	
	Pterodroma mollis	Soft-plumaged petrel	10,000s	Taylor 2000			
	Puffinus assimilis	Subantarctic little shearwater	100,000	Taylor 2000; Imber 1983			
	Puffinus bulleri	Buller's Shearwater	2,500,000	Taylor 2000; Harper 1983		Vulnerable	
	Puffinus carneipes	Flesh-footed shearwater	156,000-4,375,000	Baker *et al.* 2002		*	
	Puffinus creatopus	Pink-footed shearwater	17,000	Guicking 1999		Vulnerable	
	Puffinus gavia	Fluttering shearwater	100,000	Taylor 2000			
	Puffinus gravis	Great shearwater	Millions	Marchant and Higgins 1990			
	Puffinus griseus	Sooty shearwater	Millions	Baker *et al.* 2002		*	48.6, 88.1, 58.4.1, 58.4.2, 58.4.3, 58.5.2
	Puffinus huttoni	Hutton's shearwater	94,000	Taylor 2000		Endangered	
	Puffinus tenuirostris	Short-tailed shearwater	13-16 million	Baker *et al.* 2002		*	88.1, 58.4.1, 58.4.2, 58.4.3, 58.5.2
	Thalassoica antarctica	Antarctic petrel	500,000-7,000,000	Van Franeker *et al.* 1999		*	
	Pelecanoididae	Diving petrels					
	Pelecanoides urinatrix	Subantarctic diving petrel	>1,000,000	Taylor 2000			
	Hydrobatidae	Storm petrels					

#	Species Name	English Name	Global Population Estimate (breeding pairs)	Reference	U.S. Status	CCAMLR and IUCN Status (SC-CCAMLR-XXII/BG/18 and Redlist)*	CCAMLR Areas (SC-CCAMLR-XXII/ BG/17)
	Fregatta tropica	Black-bellied storm petrel	>50,000 - 100,000	Taylor 2000			
	Oceanites nereis	Grey-backed storm petrel	>10,000-50,000	Taylor 2000			
	Oceanites oceanicus	Wilson's storm petrel	>1,000,000	Marchant and Higgins			
	Charadriiformes						
	Chionidae	Sheathbills					
	Chionis alba	Snowy (American) sheathbill					
	Chionis minor	Lesser (Black-faced) sheathbill					
	Laridae	Gulls, terns, skuas and jaegers					
	Catharacta chilensis	Chilean skua					
	Catharacta lönnbergi	Antarctic skua	7,000	Taylor 2000			
	Catharacta maccormicki	South polar skua	8,000	Higgins and Davies 1996			
	Catharacta skua	Great skua	13,000	Phillips *et al*. 1999			
	Larus dominicanus	Southern black-backed gull, Kelp gull	>1,000,000	Taylor 2000			
	Sterna vittata	Antarctic tern	>35,000	Taylor 2000			
	Sterna virgula	Kerguelen tern	2,000	BirdLife International 2003		Near-threatened	
	Sphenisciformes						
	Spheniscidae	Penguins					
	Aptenodytes forsteri	Emperor penguin	>135,000	Marchant and Higgins 1990			
	Aptenodytes patagonicus	King penguin	>1,100,000	Marchant and Higgins 1990			

#	Species Name	English Name	Global Population Estimate (breeding pairs)	Reference	U.S. Status	CCAMLR and IUCN Status (SC-CCAMLR-XXII/BG/18 and Redlist)*	CCAMLR Areas (SC-CCAMLR-XXII/ BG/17)
	Eudyptes chrysolophus	Macaroni penguin	>9,000,000	Marchant and Higgins 1990		Vulnerable	
	Eudyptes chysocome	Rockhopper penguin	3,670,000	BirdLife International 2003		Vulnerable	
	Pygoscelis adeliae	Adélie penguin	>2,600,000	Marchant and Higgins 1990			
	Pygoscelis antarctica	Chinstrap penguin	6,500,000	Marchant and Higgins 1990			
	Pygoscelis papua	Gentoo penguin	260,000	Marchant and Higgins 1990		Near-threatened	
	Pelecaniformes						
	Phalacrocoracidae						
	Phalacrocorax atriceps (verrucosus)	Blue-eyed shag (Kerguelen cormorant, Imperial shag)					
	Phalacrocorax bransfieldensis	Antarctic shag	11,000	Marchant and Higgins 1990			
	Phalacrocorax melanogenis	Crozet shag	1,000	Marchant and Higgins 1990			

* Species with an asterisk in the last column are expected to be vulnerable to fisheries bycatch based on having an average body weight greater than 500 grams, with the capability to swallow hooks (see Baker *et al*. 2002).
# column indicates the number of the corresponding species description under the "Affected Environment" section.

3.2 Fishery Participants, Gear Types, and Affected Area

This section discusses the major fisheries, including gear types and restrictions. It also provides general information on CCAMLR catch and effort data and the use of trawls in the CCAMLR Convention Area. For a description of the affected area, see Sec. 1.1 that describes the Convention Area.

CCAMLR Catch and Effort Data

Catch and effort information is collected by CCAMLR for each fishery. The CCAMLR Statistical Bulletin provides this information and is available to the public (CCAMLR website at: http://www.ccamlr.org/pu/e/pubs/sb/evol16.htm). Annual summary catch and effort information includes:

a. Catch and effort by species and area/subarea/division;
b. Catch and effort by species and country;
c. Catch and effort by species and area/subarea/division, species and country;
d. Catch and effort by species and month; and
e. Catch and effort by area/subarea/division, species and month.

For the fisheries for *Dissostichus spp.* (Patagonian toothfish and Antarctic toothfish) and *Champsocephalus gunnari* (mackerel icefish), catch and effort information is collected on a haul-by-haul basis. However, haul-by-haul catch per unit effort (CPUE) is not made freely available to member countries, as it constitutes industrial proprietary information. For *Euphausia superba* (krill) fisheries, catch and effort information is of considerably lower resolution, and required only on a monthly basis. Although site-specific CPUE information is not available for U.S. or foreign vessels, the CCAMLR Statistical Bulletin, Vol. 16, Tables 7.2, 8.2, 9.2, 11.2, 11.3, and 11.4 do provide effort data (by fishing hours, thousand hooks, and pot hauls) by CCAMLR area/subarea/division, target species, and country. Detailed catch and effort data are provided below in the sections addressing the major CCAMLR fisheries.

Use of Trawls in the CCAMLR Convention Area

Fisheries for *Euphausia superba*, *Dissostichus eleginoides* (Patagonian toothfish), and *Champsocephalus gunnari* have been conducted within the CCAMLR Convention Area under various Conservation Measures (CMs) using pelagic trawls, bottom trawls and pots (fish traps). There are three CCAMLR CMs that specify gear restrictions for trawl fisheries.

CCAMLR CM 22-01, enacted in 1986, specifies mesh size regulations for all species, seasons, and areas open to trawl fishing. Articles 1 and 2 of CM 22-01 set forth the requirements for, and use of, gauges to be used in measuring mesh size. Articles 3, 4 and 5 describe the process for determining mesh size and Article 6 provides the procedures for inspection of nets.

CCAMLR CM 22-02, in effect since September 1, 1985, sets forth the mesh size regulations for pelagic and bottom trawls for all *Dissostichus spp.* and targeted demersal finfish, in all seasons and areas open to trawl fishing. It dictates a minimum mesh size of 120 mm for the directed fishery for *Notothenia rossii* and *Dissostichus eleginoides* and 80 mm for *Gobinotothen gibberifrons, Notothenia kempi,* and *Lepidonotothen squamifrons*. This CM does not apply to fishing conducted for scientific research purposes.

CCAMLR CM 22-03, in effect since November 1, 1991, sets forth the mesh size regulations for pelagic and bottom trawls for all *Champsocephalus gunnari* fisheries in all seasons and areas open to trawl fishing except for the waters adjacent to the Kerguelen and Crozet Islands. It specifies a minimum mesh size of 90 mm. As with CM 22-02, this CM does not apply to fishing conducted for scientific research purposes.

Bottom trawling is also conducted for research purposes in Subareas 48.1, 48.2, 48.3, and Division 58.5.2. Specific components and detailed descriptions of research bottom trawls are only available for Subareas 48.1 and 48.2, where scientific surveys are periodically conducted by the U.S. AMLR Program. The U.S. AMLR bottom trawl survey uses a factory made NET Systems Hard Bottom Snapper Trawl (# 92/122/5") rigged with tire gear ground tackle for use on rocky bottom terrain.

Toothfish Fishing

Toothfish (*Dissostichus spp*.) are highly prized table fish with significant imports to markets in Japan, Europe, and North America, where it is marketed as Chilean Sea Bass. Fishing is undertaken in areas managed by CCAMLR, in the EEZs of several countries both inside and outside the CCAMLR Convention Area, and in international waters. Legal fishing of toothfish began primarily as bycatch in the 1970s and developed into a targeted fishery in the mid-1980s with the introduction of demersal longline fishing, originally around South Georgia and Kerguelen Island.

By the mid-1990s, the fishery had expanded from the Falkland Islands and South Georgia to include the waters surrounding several sub-Antarctic Indian Ocean islands. Over the past ten years, fishing effort has been largely concentrated in Subareas 48.3 (South Georgia Island) and 58.5 (Kerguelen and Heard Islands). Historically, Patagonian toothfish harvests have been significantly higher than Antarctic toothfish harvests, but the total CCAMLR catch of Antarctic toothfish has increased steadily for the past several years. Vessels fishing for toothfish are predominantly demersal longliners. There is also a smaller trawl fishery for toothfish, and experimental fishing trials using pot gear.

Within the CCAMLR Convention waters, the Subareas and Divisions currently open for *Dissostichus spp*. fishing are: Subareas 48.3; 48.4; 48.6; Divisions 58.4.1;

58.4.2; 58.4.3; 58.5.1; 58.5.2; Subareas 58.6; 58.7; 88.1 and 88.2. Vessels from Argentina, Australia, France, Japan, Korea, Namibia, New Zealand, Russia, South Africa, Spain, Ukraine, United Kingdom, United States, and Uruguay have participated in the trawl and longline, exploratory and assessed CCAMLR fisheries for toothfish. See Section 2.1 for a discussion of assessed and exploratory fisheries in the CCAMLR region.

Toothfish Longline Fishery Gear Description, Depths Deployed, Locations, and Seasons

A. Gear Description

Longline gear configurations may differ considerably from vessel to vessel in the Southern Ocean *Dissostichus spp.* fishery. However, there are two primary longline gear designs used in these fisheries: the traditional single-line configuration (Figure 8), and the double-line 'Spanish' longline system (Figure 9). The single-line method consists of regularly spaced, anchored buoy lines that support a main line (ground line) with branchlines (snoods) strung with baited hooks. The double-line 'Spanish' system consists of an anchored buoy line that supports a main line in which railings are used to support the fishing line, which is strung with baited hooks. The number of hooks per longline set can vary substantially, averaging 5,000-8,000 hooks.

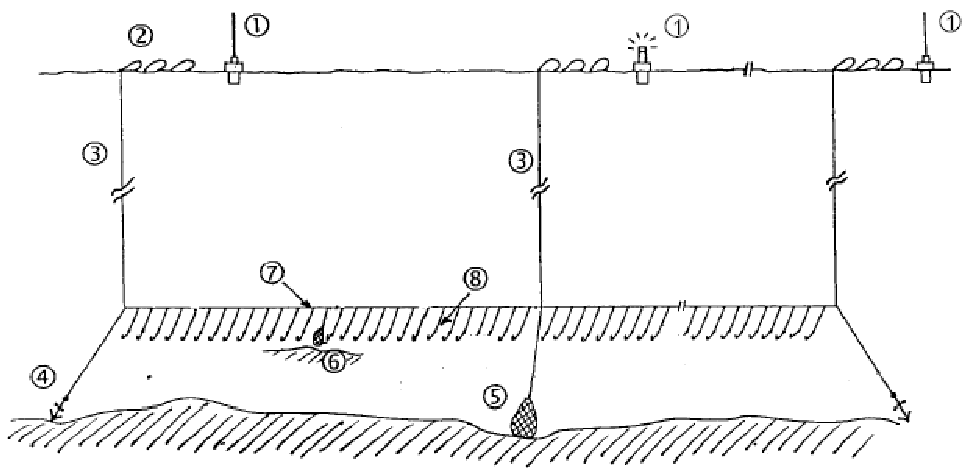


Figure 8 (Sec. 3.2): Configuration of a 'traditional' single-line bottom longline. 1 - Buoys; 2 - Floats; 3 - Buoy line; 4 - Anchor; 5 and 6 - Stone anchors; 7 - Main line (ground line); and 8 - Branchlines (snoods) with hooks. Source: CCAMLR Scientific Observers Manual (http://www.ccamlr.org/pu/e/e_pubs/obsman.pdf).

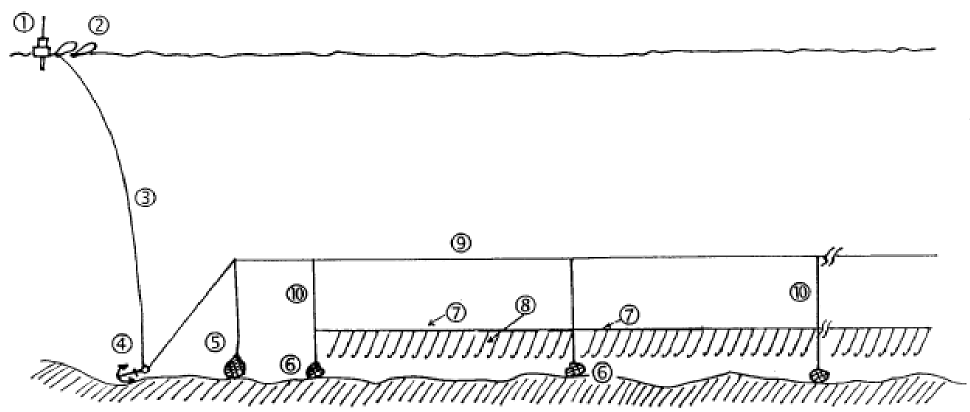


Figure 9 (Sec. 3.2): Configuration of a 'Spanish type' double-line bottom longline. 1 - Buoy; 2 - Floats; 3 - Buoy line; 4 - Anchor; 5 and 6 - Stone anchors; 7 - Fishing line; 8 - Branchlines (snoods) with hooks; 9 - Main line; and 10 - Railing. Source: CCAMLR Scientific Observers Manual (http://www.ccamlr.org/pu/e/e_pubs/obsman.pdf).

B. Testing Trials

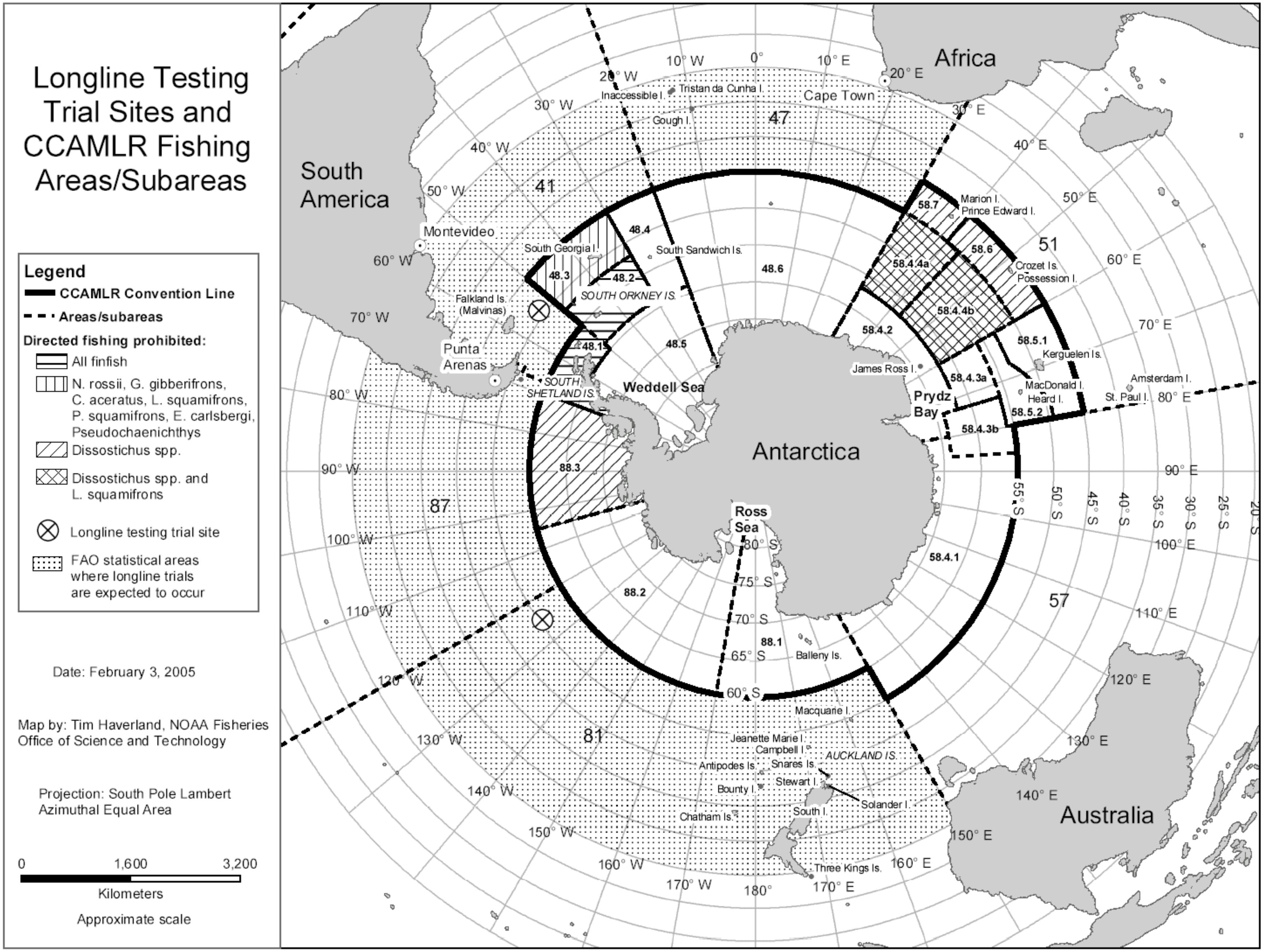
CCAMLR Conservation Measure 24-02 offers the option of longline testing trials prior to entering CCAMLR Convention waters for any vessel wishing to fish its longline gear during daylight hours in Convention waters. The line-weight testing must be conducted according to one of two CCAMLR protocols (Protocol A for vessels monitoring longline sink rate with Time-Depth Recorders and using longlines to which weights are manually attached; or Protocol B for vessels monitoring longline sink rate with bottle tests and using longlines to which weights are manually attached). NMFS does not have access, other than for two previously flagged U.S. fishing vessels, the F/V America No. 1 and F/V American Warrior, to information on longline testing or weighting trials that occurred outside of CCAMLR Convention waters (i.e., catches in areas of national jurisdiction, as well as catches taken on the high seas).

The America No. 1 conducted trials in the high seas of the South Atlantic (FAO Statistical Area 41) from 21-Nov-03 to 23-Nov-03 at 54°07' S, 53°33' W in depths ranging from 1,345 to m 1,737 m. The following map "Longline Testing Trial Sites and CCAMLR Fishing Areas/Subareas" displays the area where the F/V America No. 1 conducted its test trials and the two ports where U.S. fishers have home ported or staged their CCAMLR fishing activities -- Punta Arenas, Chile (53° 11' S latitude, 70° 56' W longitude), and Montevideo, Uruguay (35° S latitude, 56° 13' W longitude) -- during the past decade, and most likely to be used by U.S. vessels that may longline in CCAMLR waters in future years. The map also shows a third port -- Cape Town, South Africa (33° 55' S latitude, 18° 22' E longitude) -- that is apt to be used by U.S. longline vessels in future years. The F/V America No. 1 deployed 6 lines using the Spanish longline system. One line consisted of 4,000 hooks and the other 5 contained 10,000 hooks each. Of the 6 lines shot, 3 lines were shot with baited hooks while the remaining 3 were shot without hooks. The vessel successfully completed 20 line sink rate tests as required by

CCAMLR CM 24-02. The observer report indicated no observed interactions with seabirds, pinnipeds, or cetaceans during the course of the F/V America No. 1's testing trials. (Source: Observer report by Hennie Crous, NOAA Observer.)

The F/V American Warrior conducted longline testing trials over a ridge in the Pacific Ocean (FAO Statistical Area 81) from 28-Dec-03 to 29-Dec-03 at 55°29' S, 124°52′ W in depths ranging from 1,100 m to 1,620 m. The following map "Longline Testing Trial Sites and CCAMLR Fishing Areas/Subareas" displays the area where the F/V American Warrior conducted its test trials and the two ports where U.S. fishers have home ported or staged their CCAMLR fishing activities -- Punta Arenas, Chile, and Montevideo, Uruguay -- during the past decade, and most likely to be used by U.S. vessels that may longline in CCAMLR waters in future years. The map also shows a third port -- Cape Town, South Africa -- that is apt to be used by U.S. longline vessels in future years. The F/V American Warrior used 1.4 m hook spacing with 896 hooks per magazine with a total of 4 magazines set per line, for a total of 3,584 baited hooks per line. The observer report indicated no observed interactions with seabirds, pinnipeds, or cetaceans during the course of the F/V American Warrior's testing trials. (Source: Observer report by Eric N. Dobbs, NOAA Observer.)

Because the two most northerly ports mentioned above -- Montevideo, Uruguay and Cape Town, South Africa -- are both essentially located at 35° S latitude, future longline testing trials by U.S. flagged vessels outside CCAMLR waters but on the way to CCAMLR fishing grounds for toothfish are expected to occur south of 35° S latitude and within FAO Statistical Areas 41, 47, 81, and 87, as shown on the following map "Longline Testing Trial Sites and CCAMLR Fishing Areas/Subareas." Fishing vessels can reach all CCAMLR toothfish fishing areas by transitting one or more of these four FAO Statistical Areas.


Longline Testing Trial Sites and CCAMLR Fishing Areas/Subareas
Legend
CCAMLR Convention Line
Areas/subareas
Directed fishing prohibited:
All finfish
N. rossii, G. gibberifrons, C. aceratus, L. squamifrons, P. squamifrons, E. carlsbergi, Pseudochaenichthys
Dissostichus spp.
Dissostichus spp. and L. squamifrons
Longline testing trial site
FAO statistical areas where longline trials are expected to occur
Date: February 3, 2005
Map by: Tim Haverland, NOAA Fisheries Office of Science and Technology
Projection: South Pole Lambert Azimuthal Equal Area
0
1,600
3,200
Kilometers
Approximate scale
South America
Africa
Australia
Antarctica
Montevideo
Cape Town
Punta Arenas
Falkland Is. (Malvinas)
South Georgia I.
South Sandwich Is.
SOUTH ORKNEY IS.
SOUTH SHETLAND IS.
Inaccessible I.
Tristan da Cunha I.
Gough I.
Marion I.
Prince Edward I.
Crozet Is.
Possession I.
Kerguelen Is.
MacDonald I.
Heard I.
Amsterdam I.
St. Paul I.
James Ross I.
Prydz Bay
Weddell Sea
Ross Sea
Balleny Is.
Macquarie I.
Jeanette Marie I.
Campbell I.
AUCKLAND IS.
Antipodes Is.
Snares Is.
Stewart I.
Bounty I.
Solander I.
Chatham Is.
South I.
Three Kings Is.
41
47
51
57
81
87
48.1
48.2
48.3
48.4
48.5
48.6
58.4.1
58.4.2
58.4.3a
58.4.3b
58.4.4a
58.4.4b
58.5.1
58.5.2
58.6
58.7
88.1
88.2
88.3
0°
10° E
20° E
30° E
40° E
50° E
60° E
70° E
80° E
90° E
100° E
110° E
120° E
130° E
140° E
150° E
160° E
170° E
180°
170° W
160° W
150° W
140° W
130° W
120° W
110° W
100° W
90° W
80° W
70° W
60° W
50° W
40° W
30° W
20° W
10° W
20° S
25° S
30° S
35° S
40° S
45° S
50° S
55° S
60° S
65° S
70° S
75° S
80° S

C. Depths and Locations of the Longline Fishery

Longline set depths are variable. *Dissostichus spp.* have been fished from 400 to 2,000 meters, with most longlines set around 1,000 meters. Longline fishing for Patagonian toothfish, *D. eleginiodes*, has taken place in several areas of the Southern Ocean, including South Georgia (Subarea 48.3), Kerguelen (Division 58.5.1), Heard and McDonald Islands (Division 58.5.2), Crozet Islands (Subarea 58.6) and Prince Edward and Marion Islands (Subarea 58.7). Antarctic toothfish, *D. mawsoni*, has only been fished commercially in the Ross Sea (Subarea 88.1 and 88.2).

D. Longline Fishing Seasons

The longline fishery in the Southern Ocean can take place at any time during the season established by the CCAMLR Commission for the subarea or division managed, or until the total allowable catch has been reached for that area. The CCAMLR season lasts from 1 December to 30 November, though specific Subareas and Divisions are subject to closures during part of the season. Seasons for *Dissostichus spp*. longline fisheries are set annually in the Schedule of Conservation Measures. The seasons stipulated in the Schedule of Conservation Measures in Force for 2003/2004 are as follows:

Subarea 48.3 – 1 May to 31 August, 2004. The season may be extended to 14 September for any vessel that has demonstrated full compliance with CM 25-02 (all seabird bycatch mitigation measures). Fishing shall also cease for the season for any vessel that catches three seabirds. (CM 41-02).

Subarea 48.4 - 1 May to 31 August, 2004. The season may be extended in 14 September for any vessel that has demonstrated full compliance with CM 25-02 (all seabird bycatch mitigation measures). Fishing shall also cease for the season for any vessel which catches three seabirds. (CM 41-03).

Subarea 48.6 (exploratory) – 1 March to 31 August 2004 north of 60° S and 15 February to 15 October 2004 south of 60° S. (CM 41-04).

Division 58.4.1 (exploratory) - 1 December 2003 to 30 November 2004. (CM 41-11).

Division 58.4.2 (exploratory) - 1 December 2003 to 30 November 2004. (CM 41-05).

Division 58.4.3a outside areas of national jurisdiction (exploratory) – 1 May to 31 August 2004. (CM 41-06).

Division 58.4.3b outside areas of national jurisdiction (exploratory) – 1 May to 31 August 2004. (CM 41-07).

Division 58.5.2 - 1 May to 31 August 2004. The season may be extended to 14 September for any vessel that has demonstrated full compliance with CM 25-02 (all seabird bycatch mitigation measures). Fishing shall also cease for the season for any vessel that catches three seabirds. (CM 41-08).

Subarea 88.1 (exploratory) - 1 December 2003 to 31 August 2004. (CM 41-09).

Subarea 88.2 (exploratory fishery south of 65° S) – 1 December 2003 to 31 August 2004. (CM 41-10).

Illegal, Unregulated and Unreported Toothfish Fishing

During the past decade, illegal, unregulated and unreported (IUU) fishing for toothfish has been a significant problem within and adjacent to the Convention Area. Substantial catches of toothfish have been taken by longline fishing well in excess of CCAMLR TAC limits. CCAMLR reports that during 1996-1999, the amounts of toothfish taken by IUU fishing have been estimated to be approximately 90,000 mt, which is more than twice the catch taken in CCAMLR regulated fisheries. See Table 8 below. IUU fishing has caused a significant depletion of stocks in some areas as well as unacceptably high levels of seabird bycatch and mortality, including several species of albatrosses and petrels.

However, at its Fall 2002 meeting, the CCAMLR Scientific Committee (SC) noted that in terms of assessing the total removals of toothfish, including an analysis of IUU fishing, there were several components of the issue, the combination of which could lead to a "double counting" of catches. The possible double counting of catches is a result of the different sources of data used by the SC. The information is received in the traditional method as well as from the Catch Documentation Scheme (CDS) data summaries provided by the Secretariat. A further difficulty with the information is that there is some misreporting of catch levels and statistical areas on the Dissostichus Catch Document (DCD) which further compounds the problem of double counting.

For the 2003/2004 fishing season, the estimate of total IUU fishing for toothfish fell dramatically from the previous season. The 2003-2004 estimate of 2,622 mt represented a 75 percent drop from the 10,070 mt estimated during the previous season. The SC noted that the highest level of IUU catch inside the Convention Area during the 2003/04 season was 643 mt from Division 58.5.1, down from 7,825 mt from this Division during the 2002/03 season. CDS-reported catches in Areas 41, 51 and 57 outside the Convention Area also declined.[2] The SC indicated that the likely causes of the decreases in Areas 41, 51 and 57 include the successful implementation of the CCAMLR CDS and other CCAMLR compliance and monitoring measures, a receipt of fewer DCDs due to reflagging, and some depletion of toothfish stocks. With respect to stock depletion as a reason, the SC noted that more data are needed to assess its plausibility. Given that there was a significant decline in the number of toothfish reported as harvested in Areas 51 and 57, this also seems to indicate the success of the U.S. ban on imports from these areas.

[2] SC-CAMLR-XXIII, Annex 5, Table 3.2

Table 8 (Sec. 3.2): Estimates of illegal, unreported, and unreported toothfish catch from the CCAMLR convention area (in mt).

	Split Year	Split Year	Split Year	Split Year	Split Year	Split Year	Split Year	Split Year	Season	Season	Season
Subarea/Div.	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2000/01	2001/02	2002/03
48.3						300-400	396	300	196	3	
48.4.2										295	113
58.4.4					900	1,845	1,050	1,540	1,247	880	128
58.5.1				2,000	11,825	620	2,100	3,300	4,550	6,300	7,825
58.5.2				7,200-12,000	7,000	160	800	1,649	2,004	3,489	1,512
58.6				18,900	1,765	1,748	1,980	660	685	720	354
58.7				11,900	925	140	220	150	120	78	138
88.1										92	
Total IUU	6,604[1]	6,171[1]	10,000-20,000[2]	40,000-44,800[3]	22,415[4]	6,653[4]	6,546[5]	7,599[6]	8,802[7]	11,857[8]	10,070[8]

Sources:
[1]SC-CAMLR-XIV (1995) Pg. 407
[2]SC-CAMLR-XV (1996) Pg. 313
[3]SC-CAMLR-XVII (1998) Pg. 421
[4]SC-CAMLR-XVIII (1999) Pg. 343
[5]SC-CAMLR-XIX (2000) Pg. 348
[6]SC-CAMLR-XX (2001) Pg. 348
[7]SC-CAMLR-XXI (2002) Pg. 415
[8]SC-CAMLR-XXII (2003) Pg. 440

Basis for estimating IUU Fishing:

The CCAMLR WG-FSA has used the same method to estimate IUU fishing effort for several years. This method uses information on the number of vessels sighted (which is submitted by CCAMLR Members), and information on fishing trips and catch rates derived from CCAMLR data on licensed vessels.

Because the WG-FSA meets every October before the end of the CCAMLR fishing season (every October), the estimates of IUU catch and effort are then pro-rated to the end of the season (30 November 2003). The estimates of IUU are often revised during the subsequent WG-FSA, when new information is made available to the Secretariat.

CCAMLR is considering methodologies for estimating IUU fishing and facilitating a more direct interaction between the WG-FSA and the CCAMLR Standing Committee on Inspection and Compliance (SCIC). One of the improvements would be to take explicit account of both “seen” and “unseen” IUU fishing, as well as use of a simulation model to arrive at more statistically rigorous estimates and confidence intervals of IUU catches.

To combat IUU fishing for toothfish, CCAMLR introduced a CDS in May 2000 to monitor landings and global trade in toothfish. The CDS is set forth in CCAMLR Conservation Measure 10-05 for the 2003/04 fishing season. To regulate toothfish imports into and re-exports from the United States, NMFS implemented a CDS program in 2000 that requires a Dissostichus Catch Document (DCD) to accompany all shipments. In 2003, NMFS refined those regulations to include a pre-approval system (see 50 CFR 300.113). See Section 2.2 for a discussion of the pre-approval system.

Toothfish Catch and Effort Data

To date, three U.S.-registered vessels have obtained permits to harvest toothfish in the CCAMLR Convention Area. In the 1994/95 fishing season, one U.S. vessel harvested 9 mt of Patagonian toothfish in the CCAMLR Convention Area and 178 mt in the 1995/96 season. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 8.1). In the 2003/04 fishing season, permits were issued for two U.S. vessels (the F/V America No. 1 and the F/V American Warrior) to harvest toothfish in Convention Subarea 88.1. Those vessels harvested 187 mt of toothfish in Subarea 88.1 prior to exiting the fishery in April 2004 (CCAMLR WG-FSA).

The total reported catch of Patagonian toothfish within the CCAMLR Convention Area for the 2002/03 season was 14,779 mt and the total reported catch for Antarctic toothfish was 2,029 mt. See Table 10 below. For the 2003/04 fishing season, CCAMLR set a TAC of 13,696 mt for *Dissostichus spp.* in all Convention Areas combined. In setting the TAC, CCAMLR takes into account the impact of IUU fishing on toothfish stocks. The overall TAC is allocated by Convention subareas. It is not allocated by country or vessel and is therefore available to all vessels participating in the fishery until the TAC is reached.

Total global removals (including estimated IUU catches) of toothfish in the 2002/03 season by longline and trawl was reported by the CCAMLR Scientific Committee as 44,920 mt, compared to 62,643 mt during the 2001/02 season. (Report of the Twenty-Second Meeting of the Scientific Committee, SC-CAMLR-XXII, Annex 5, Table 3.2)

Based on data reviewed by the CCAMLR Scientific Committee at its Fall 2004 meeting, the reported catch of toothfish within the CCAMLR Convention Area in the 2003/04 fishing season was 13,307 mt compared with 18,507 mt in the previous season. Catch outside the Convention Area was 10,966 mt during the 2003/04 season compared with 24,137 mt in the previous season. The catch of toothfish outside the Convention Areas as reported in the CDS data in 2003/04 was 6,342 mt and 3,701 mt for Areas 41 and 87 respectively, down from 10,001 mt and 5,745 mt. The CDS estimate of 3,746 tons of toothfish caught on the high seas outside the Convention Area during 2003/04 was also much lower than the estimate of 11, 955 mt taken in 2002/03.

The Food and Agriculture Organization of the United Nations (FAO) tracks worldwide harvests of toothfish, but does not include IUU catches in its overall totals. The FAO totals are set forth in Table 9 below.

Table 9 (Sec. 3.2): World Catches of Patagonian Toothfish, 1993 – 2002 (in mt)

	Area						
	SW Atlantic	SE Atlantic	So. Ocean (Atlantic)	So. Ocean (Indian Ocean)	SW Pacific (New Zealand)	SE Pacific	Total
1993	3,961		3,089	3,692		20,997	31,739
1994	13,747		508	7,310		20,902	42,467
1995	21,190		3,262	8,119		15,694	48,265
1996	14,951		3,602	5,656	1,061	6,993	32,263
1997	9,599		3,812	8,587	5	8,059	30,062
1998	13,328		3,201	9,896	43	9,172	35,640
1999	11,300		3,636	9,569	1	10,328	34,834
2000	11,122	320	4,939	13,081	0	10,676	40,138
2001	13,815	5	4,048	15,759	14	6,579	40,220
2002	11,090	906	5,744	12,946	12	7,194	37,892

Source: FAO, Fishery Statistics, 2004

Table 10 (Sec. 3.2): Catch by Species and Area (in mt)
Species: *Dissostichus eleginoides* and *Dissostichus mawsoni*

Species	Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	01/02	02/03	03/04*
D. eleginoides	48											
D. eleginoides	48.1					0						
D. mawsoni	48.1					1			0			
Total	48.1	0	0	0	0	1	0	0	0	0		
D. eleginoides	48.2					0		36				
D. mawsoni	48.2						0					
Total	48.2	0	0	0	0	0	0	36	0	0		
D. eleginoides	48.3	658	3,371	3,602	3,812	3,201	3,636	4,904	4,047	5,742	7,528	4,482
D. eleginoides	48.4											0
D. eleginoides	48.6											7
D. eleginoides	58							56	8			
D. eleginoides	58.4.2								0		0	20
D.												

Species	Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	01/02	02/03	03/04*
mawsoni	58.4.2										117	
Total	58.4.2	0	0	0	0	0	0	0	0	0	117	20
D. eleginoides	58.4.3				0		0					
D. eleginoides	58.4.3a											
D. eleginoides	58.4.3b											7
D. eleginoides	58.4.4							99				
D. eleginoides	58.4.4a											
D. eleginoides	58.4.4b											
D. eleginoides	58.5											
D. eleginoides	58.5.1	5,381	5,596	4,710	5,059	4,714	4,730	6,139	4,747	4,154	3,686	
D. eleginoides	58.5.2				1,927	3,765	3,547	3,566	2,980	2,756	2,844	2,796
D. eleginoides	58.6	56	115	76	466	1,053	1,152	1,096	1,127	1,225	476	
D. eleginoides	58.7			869	1,193	637	301	1,015	235	98	219	
D. eleginoides	88.1				0	1	1	0	34	12	26	
D. mawsoni	88.1					41	296	751	626	1,313	1,805	2,166
Total	88.1	0	0	0	0	42	297	751	660	1,325	1,831	2,166
D. eleginoides	88.2									0		375
D. mawsoni	88.2									41	106	
Total	88.2	0	0	0	0	0	0	0	0	41	106	375
D. eleginoides	88.3					0						
D. mawsoni	88.3					0						
Total	88.3	0	0	0	0	0	0	0	0	0	0	0
D. eleginoides	Subtotal	6,095	9,082	9,257	12,457	13,370	13,367	16,913	13,178	13,987	14,779	7,687
D. mawsoni	Subtotal	0	0	0	0	42	296	751	626	1,354	2,029	2,166
	TOTAL	6,095	9,082	9,257	12,457	13,412	13,663	17,664	13,804	15,341	16,808	9,853

Source: CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 7.1
* CCAMLR WG-FSA

Over the past ten years, fishing effort for Patagonian toothfish has been largely concentrated in Subareas 48.3 (South Georgia Island) and 58.5 (Kerguelen and Heard Islands). See Table 11 below. Outside of Subareas 48.3 and 58.5, Subarea 88.1 is the only other area in which significant effort has been documented (2,777 hours of effort in the 2002/03 season).

Table 11 (Sec. 3.2): Effort (fishing hours) by Target Species and Area
Species: *Dissostichus eleginoides* and *Dissostichus mawsoni*

Target Species	Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/2000	00/01	01/02	02/03
D.eleginoides	48.1										
D.eleginoides	48.2										
D.eleginoides	48.3	1,558	4,939		4,022		164	1,542	7,032	12,650	25,599
D.eleginoides	48.4										
D.eleginoides	58										
D.eleginoides	58.4.1						5				
D.eleginoides	58.4.2							0			
D.eleginoides	58.4.3				8		14				
D.eleginoides	58.4.4										
D.eleginoides	58.5										
D.eleginoides	58.5.1	2,779	2,905	1,557	907	2,510	2,937	4,360	3,513	306	
D.eleginoides	58.5.2				961	796	587	1242	536	23	814
D.eleginoides	58.6	101	106	8			184				
D.eleginoides	58.7										
D.eleginoides	88.1										
Subtotal		4,438	7,950	1,565	5,898	3,306	3,892	7,144	11,081	12,979	26,413
D.mawsoni	58.4.2										
D.mawsoni	88.2										
Subtotal											
Dissostichus spp	48.1										
" "	48.2										
" "	58.4.2										
" "	88.1										2,777
" "	88.2										
" "	88.3										
Subtotal											2,777

Source: CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 7.2

<u>Icefish Fishing</u>

Eight species of icefish are caught in the CCAMLR Convention Area, although over 99% of icefish landed is mackerel icefish (*Champsocephalus gunnari*). *C.gunnari* was fished extensively during the late 1970s and in the 1980s. Annual catches of *C. gunnari* peaked at 30,357 mt in Subarea 48.1 in 1978/79, 138,895 mt in Subarea 48.2 in 1977/78 and 178,824 mt in Subarea 48.3 in 1982/83. (Statistical Bulletin, Vol. 6 Rev. 1 (Electronic Version), Table 7.1). In Subarea 58, annual catches of *C. gunnari* peaked at 38,654 mt in Division 58.5.1 in 1976/77 and 15,201 mt in Division 58.5.2 in 1976/77. (Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 7.1).

Within the CCAMLR Convention Area, the icefish fishery is conducted using pelagic (midwater) trawls and bottom trawls. Currently, the CCAMLR icefish fishery is limited to Subarea 48.3 and Division 58.5.2. Concern over levels of bycatch of other finfish species (e.g., *Gobionotothen gibberifrons, Chaenocephalus aceratus,* and *Notothenia rossii*), in bottom trawls resulted in a ban on bottom trawling for *C. gunnari* in Subarea 48.3 starting in the 1989 CCAMLR fishing season. Similarly, in Subareas 48.1 and 48.2, *C. gunnari* were depleted in the late 1970s, and the fishery continued at a low level. The fishery has been closed in Subareas 48.1 and 48.2 since 1990 to avoid high bycatch levels and to allow *C. gunnari* stocks to recover. Bottom trawling is still permitted at Heard and McDonald Islands in Division 58.5.2.

Conservation measures aimed at reducing bycatch in the targeted *C. gunnari* fisheries were introduced in 1989 at South Georgia and in 1997 at Heard and McDonald Islands, and have remained in force since then. Bycatch measures have included both "trawl-by-trawl" bycatch limits that encourage trawlers to move away from areas where the catch of another species exceeds certain limits and overall area bycatch limits which would lead to closure of the fishery. (CCAMLR SC, 2001; CM 42-01 and CM 42-02).

Over the last ten years, the average harvest of *C. gunnari* in the CCAMLR Convention Area has been 1,879 mt, with 4,331 mt harvested in the 2002/03 fishing year, representing the largest harvest in the past decade. See Table 12 below. The major producers are Australia, Chile, Great Britain, Korea, Russia, and the Ukraine. The United States has not participated in the directed fishery for this species although it has made small harvests as bycatch in the krill fishery in two recent seasons: 1 mt in the 1998/99 fishing season and 1 mt in the 2000/01 season (no icefish was taken as bycatch by the U.S. krill fisher in 2002/03 or 2003/04). Currently, there are no U.S. vessels participating in the CCAMLR icefish fishery.

In Subarea 48.3, the TAC for the 2003/04 season was 2,887 mt with a limit of 722 mt from March 1, 2004 to May 31, 2004. The inshore waters within 12 nautical miles of South Georgia were closed for the icefish fishery from March 1 to May 31, 2004. In Division 58.5.2, the 2003/04 TAC was 292 mt. (CCAMLR Conservation Measures 42-01 and 42-02.)

Table 12 (Sec. 3.2): Catch by Species and Area (in mt)
Species: *Champsocephalus gunnari* (icefish)

Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	01/02	02/03	03/04*
48.1								1			
48.2	0					1					
48.3	13	10			6	265	4,114	960	2,667	1,986	2,685
58											
58.4											
58.4.2								11		0	
58.5.1	1,228	2,708	5	0							
58.5.2				227	115	2	137	1,136	865	2,345	51

Source: CCAMLR Statistical Bulletin, Vol. 16 (electronic version), Table 7.1
* CCAMLR WG-FSA

In the past decade, fishing effort for *C. gunnari* has been concentrated in Subarea 48.3 and Division 58.5.2, as indicated in Table 13 below. In Subarea 48.3, fishing effort for *C. gunnari* has been concentrated in the months of December, January, and February.

In Division 58.5.2, effort has been distributed throughout the year with concentrated effort in March and April in the 2002/03 season.

Table 13 (Sec. 3.2): Effort (fishing hours) by Target Species and Area/Subarea/Division
Species: *Champsocephalus gunnari* (mackerel icefish)

Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	½	02/03
48.3							639	640	2019	690
58.5.1										
58.5.2				88	176	42	50	123	6	602

Source: CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 7.2

Krill Fishing

The fishery for Antarctic krill began in the 1970s and quickly expanded to annual catches of 300,000 to 500,000 mt during the mid-1980s and early 1990s with effort concentrated in the southwest Atlantic sector. Low catches in 1983, 1984, and 1985 coincided with low krill availability and poor krill predator reproductive success at South Georgia. The decline in catches after 1992 coincides with political changes in the Soviet Union, which until then was the principal harvester. The 1994/1995 level of 135,686 mt is the largest annual catch since 1992. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 2).

CCAMLR manages fisheries in the Convention Area on a seasonal basis, from December 1 following the annual fall meeting of the Commission to November 30 of the next year. Individual fisheries within a season may be for lesser periods than a full year. The krill fishery, however, is open for the entire year. Krill fishing is conducted using mid-water pelagic trawl gear. The target depth of the hauls for the krill fishery is within the upper 50 meters of the water column. The ocean depths where krill are fished range between 100-4,000 meters. There is no interaction with the krill trawl and the bottom.

Krill is harvested in Convention Areas 48 (the Atlantic Ocean sector) and 58 (the Indian Ocean sector). CCAMLR has set a precautionary catch limit of 4 million mt per fishing season for Area 48. The catch limit is based on a harvest rate of 9.1%, which results in a 4 million mt limit for the aggregate of Subareas 48.1 (1.008 million mt), 48.2 (1.104 million mt), 48.3 (1.056 million mt) and 48.4 (0.832 million mt)(CM-51-01). CCAMLR has agreed to apply precautionary catch limits to smaller management units than these subareas of Area 48, or on such other basis as the CCAMLR Scientific Committee (SC) may advise, if the total catch in Area 48 in any fishing season exceeds 620,000 mt.

The CCAMLR SC factored cumulative harvest into its advice that the precautionary catch limit for krill be set at 4 million mt annually for Area 48. The CCAMLR SC has determined that the present and historic levels of harvest do not affect the reproductive rates or standing stock of krill to a degree that impacts either the continuing krill population or its availability to predator species of whales and seals.

The total catch of all fishers participating in the krill fishery in Area 48 for the 2002/2003 season was 116,866 mt, which was 2.9% of the available TAC for the Area. Japan (three vessels), Korea (two), Poland (one), Ukraine (two) and the United States (one) participated in the krill fishery in Area 48 in the 2002/2003 fishing season.

The total catch of all fishers participating in the krill fishery in Area 48 for the 2003/04 season was 117,899 mt, which was 2.9% of the available TAC for the Area. Great Britain (one), Japan (two vessels), Korea (two), Poland (one), Russia (one), Ukraine (two), the United States (one), and Vanuatu (one) participated in the krill fishery in Area 48 in the 2003/04 fishing season. The total catch of krill in Area 48 for the 2003/04 season was 117,899 mt. One U.S. vessel has participated in the krill fishery in Convention Area 48 during the past four seasons, harvesting 70 mt in the 1999/2000 season; 1,561 mt in the 2000/01 season; 12,175 mt in the 2001/02 season; 10,150 mt in the 2002/03 season; and 8,900 mt in the 2003/04 season.

For the 2004/05 fishing season, CCAMLR has set precautionary catch limits of 440,000 mt and 450,000 mt per fishing season respectively in Divisions 58.4.1 (CM-51-02) and 58.4.2 (CM-51-03). The catch limit in 58.4.1 is further divided into smaller units as follows: 277,000 mt west of 115° E and 163,000 mt east of 115° E. There has been no reported fishing for krill in Area 58 since the 1995/96 season. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 4.2)

Total annual catches for krill (all countries) in the CCAMLR Convention Area have historically been well below the TAC limits. Recent total annual catches for krill in the Convention Area are as follows: 117,899 mt in the 2003/04 season; 116,866 mt in 2002/03; 125,987 mt in 2001/02; and 104,182 mt were taken in 2000/01. See Table 14 below. Over the past decade, the krill fishing effort has been concentrated in Subareas 48.1, 48.2 and 48.3, which together have accounted for all the reported CCAMLR krill catch since 1996/97. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Tables 4.2 and 7.2). CCAMLR records indicate that krill harvests have been recorded in each month of the year (CCAMLR Statistical Bulletin, Vol. 16 Vol. 1 (Electronic Version), Table 11.1.) In Subarea 48.1, effort is concentrated from December through May, whereas in 48.3 effort is concentrated from June through October. Effort in Subarea 48.2 has been disbursed throughout the year. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 11.2.)

Table 14 (Sec. 3.2): Catch by Species and Area (in mt)
Species-group: Euphausiidae

Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	01/02	02/03	03/04*
41.3.2					74		4				
48											87,133
48.1	45,085	38,165	61,964	48,843	56,575	38,895	71,977	46,778	10,646	35,288	
48.2	19,259	48,833	2,734	99	6,673	62,077	16,891	4,981	72,060	15,427	
48.3	20,301	47,421	26,452	26,711	26,776	985	25,557	52,423	43,282	66,151	
48.4											
48.5											
48.6											
58											
58.4											
58.4.1	899	1,266									0
58.4.2											
58.4.3											
58.4.4			6								
88											
88.1											
88.3											

Source: CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 4.2
*CCAMLR WG-FSA

The total catch by the ten vessels, including the one U.S. vessel, participating in the 2003/04 fishery for krill reported by the CCAMLR Data manager as of November 15, 2004 was 117,899 mt, or 2.9% of the 4,000,000 mt catch limit adopted by the Commission for fishing for krill in Area 48. As in the 2002/2003 season, most of this catch came from within the 15 Small Scale Management Units in Area 48 (north of Livingston Island, west of Coronation Island and northeast of South Georgia). CCAMLR's Scientific Committee reported to the Commission in October 2004 that a total catch of 160,000 mt is a reasonable expectation for the 2004/05 season.

For environmental and logistical reasons, the krill fishery is likely to remain concentrated in the Southwest Atlantic sector of the Southern Ocean as opposed to expanding into the Pacific or Indian Ocean sectors. Because of the favorable fishing conditions in the Southwest Atlantic sector, as well as the proximity to supplies, shelter, ports and potential markets, this region may be viewed as the center of krill fishing operations. Despite the rather restricted potential for spatial expansion, the krill fishery in the South Shetlands may be far from reaching its capacity (Agnew and Nichol, 1996).

Crab Fishing

The crab fishery in the CCAMLR region has historically been very small. Since record keeping began in 1969, only 933 mt of crabs have been harvested from the CCAMLR Convention Area. Of that total, 634 mt were taken in the past ten years. See Table 15 below. The catch has been taken by the United States, Japan, and Great Britain, although the actual catches have been sporadic over time. For the 2004/05 fishing season, the CCAMLR Committee set a precautionary catch limit of 1,600 mt.

One U.S. crab vessel harvested 299 mt in 1992/93 but found it difficult to market the product, and did not fish in CCAMLR waters in 1993/94. The United States caught 283 mt in 1994/95 and 214 mt in 1995/96, which is approximately 78% of the total catch for the past decade. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 8.1). However, there has been no U.S. catch since the 1995/96 season. The one U.S. boat that participated in the CCAMLR crab fishery in past seasons has not fished for several seasons and did not seek a permit for the current fishing season.

Table 15 (Sec. 3.2): Catch by Species-group and Area (in mt)
Species-group: Lithodidae (crab)

Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	½	02/03	03/04*
48.1											
48.3	0	283	214	1	1	2	2	14	112	1	1
58.4.3				0							
58.6					0	0	0	0	0	0	
58.7				0	0	0	3	0	0	0	
88.1					0				0	0	

Source: CCAMLR Statistical Bulletin, Vol. 16 (electronic version), Table 4.2
* CCAMLR WG-FSA

The crab fishery is conducted using pots and is limited to Subarea 48.3. Typically, crab pots have a funnel-shaped opening in the top of the pot to allow entry of crabs while also serving as a collar that prevents crabs from escaping. Due to the wide opening of the collar, fish may swim freely in and out of the pot and are seldom captured. Crab pots are generally fished for 18 to 24 hours.

In Subarea 48.3, experimental fishing trials using pots (fish traps) were undertaken March-May in 2000 by the United Kingdom. These trials were conducted to determine whether a commercially viable fishery could be prosecuted using this type of gear. Australia has also notified of their intention to conduct experimental trials using pot gear for *Dissostichus eleginoides* in Division 58.5.2. Pot gear used by the United Kingdom for their trials consisted of semi-conical, approximately 80 cm high, steel frames covered in mesh with a collapsible funnel entrance situated on the side of the pot, orientated horizontally and tapering to the pot interior.

Squid Fishing

Martialia hyadesi (Seven star flying squid)

The *Martialia hyadesi* fishery is an exploratory jig fishery and is limited to Subarea 48.3. To date, Korea is the only country that has participated in this fishery.

Korea reported harvests of 52 mt in 1995/96, 81 mt in 1996/97 and 2 mt in 2000/01. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 9.1). See Table 16 below. For the 2003/04 season, the CCAMLR Committee set a precautionary catch limit of 2,500 mt for the squid fishery. The United States has done no directed fishing for *Martialia hyadesi* in the CCAMLR region.

Illex argentinus (Argentine short fin squid)

The only reported catches of *Illex argentinus* in the CCAMLR Convention area in the past decade were 18 and 49 mt, in the 2000/01 and 2001/02 fishing seasons, respectively. All of the catch was taken by Poland in Subarea 48.3. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 9.1). The United States has not participated in this fishery and currently there is no active fishery for *Illex argentinus* within the CCAMLR region, due to a lack of participating countries.

Table 16 (Sec. 3.2): Catch by Species and Area (in mt)
Species: *Illex argentinus* and *Martialia hyadesi* (squid)

Species	Area	1993/94	94/95	95/96	96/97	97/98	98/99	99/00	2000/01	01/02	02/03	03/04
Illex argentinus	48.3								18	49		
Martialia hyadesi	48.3			52	81				2			0
Total		0	0	52	81	0	0	0	20	49	0	0

Source: CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 7.1

Macrourus Fishing

The exploratory fishery for *Macrourus spp*. is relatively new and still a minor fishery within the CCAMLR region. In the 1999/00 CCAMLR season, 425 mt of *Macrourus spp*. were harvested, which was more than 2 times the amount taken in any of the preceding six years. In 2001/02, the harvest rose to 816 mt and in 2002/03 the harvest was 744 mt. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Table 7.1). The leading producers in this trawl fishery are France, New Zealand and South Africa, with most of the reported landings coming from Area 58. To date, no U.S. vessels have participated in the *Macrousus spp.* fishery and there has been no expression of interest by any U.S. fisher in doing so. For the 2003/04 CCAMLR fishing season, the *Macrourus spp*. fishery was limited to one Australian vessel with a catch limit of 26 mt and 159 mt in Divisions 58.4.3a and 58.4.3b, respectively. (CM 43-02 and 43-03).

Other Finfish

Chaenodraco wilsoni (spiny icefish); *Lepidonotothen kempi* (striped-eye notothen); *Trematomus eulepidotus* (blunt scalyhead) and *Pleuragramma antarcticum* (Antarctic silverfish)

Catches of these species have been very small over the past decade, with zero reported catch in many years. There has been some reported catch by U.S. vessels, but not more than 500 kilograms for any one species in any fishing season. (CCAMLR Statistical Bulletin, Vol. 16 Rev. 1 (Electronic Version), Tables 2 and 3.2). Currently, no U.S. vessels are actively participating in this fishery, nor does it appear likely that any will do so in the foreseeable future.

CCAMLR Conservation Measure 43-04 governed fishing activities for these four finfish species in the 2003/04 season. Under the terms of this CM, fishing was limited to one Russian vessel in Division 58.4.2 using midwater trawl only. The following catch limits applied: 2,000 mt for all species combined; 1,000 mt for *Chaenodraco wilsoni*; 500 mt for *Lepidonothen kempi*; 500 mt for *Trematomus eulepidotus*; and 500 mt for *Pleuragramma antarcticum*.

The Role of the United States in Toothfish Trade

While the United States plays a very small role in toothfish harvest, it plays a very significant role in the lucrative international trade market in toothfish. The first few rows of Table 17 show the CCAMLR harvest of toothfish as well as the total global harvest over the recent past. These data are by calendar year rather than the CCAMLR statistical periods so that they can correspond to trade data. It is broken down by product weight and live weight. TACs are measured in live weight while trade is measured in product weight.

The next row shows U.S. imports of toothfish over the same period. The total value of imports ranges from $92 to $111 million per year with an average value per kilo ranging from $9.76 to $10.54. Note that while all of the U.S. imports are not caught in CCAMLR waters, in terms of live weight, its imports are equal or greater to the total CCAMLR harvest.

The U.S. market is very important to the toothfish fishery with U.S. imports accounting for the largest percentage of global catch. In terms of market weight, they have averaged about 31% over the past four years and the figure will be higher at the completion of 2004. Because of the type of finished products that are imported, the percentage of live weight is much higher. A large part of U.S. imports is fillets as opposed to headed and gutted product and so the ratio of product weight to live weight is lower. In terms of live weight, the United States has imported about 43% of the global harvest of toothfish over the past few years. The preliminary 2004 data indicate that this figure may grow to over 50%.

Tables 18 and 19 show U.S. imports of all species of toothfish, both frozen and fresh product, by volume and by value from 1999 through June 2004. The import data are displayed by supplying country -- both CCAMLR member countries and non-member countries.

Table 17 (Sec. 3.2): Catch and U.S. Imports of Toothfish (*Dissostichus spp.*) by Calendar Year.

	2000			2001			2002			2003			2004 Jan-Oct		
	Product Weight Tonnes	Est. Live Weight Tonnes	Thousands US$	Product Weight Tonnes	Est. Live Weight Tonnes	Thousands US$	Product Weight Tonnes	Est. Live Weight Tonnes	Thousands US$	Product Weight Tonnes	Est. Live Weight Tonnes	Thousands US$	Product Weight Tonnes	Est. Live Weight Tonnes	Thousands US$
CCAMLR	12,897	17,766		10,782	14,514		11,832	16,319		13,879	19,246		9,352	12,619	
Non-CCAMLR	17,325	23,669		25,933	36,053		23,648	32,545		19,717	25,327		7,620	9,402	
Total Global Catch	30,222	41,435		36,715	50,567		35,480	48,864		33,596	44,573		16,972	22,021	
US Imports	9,518	17,802	$92,916	11,732	21,674	$104,473	11,302	21,071	$111,355	10,551	19,099	$111,258	6,646	11,877	$69,775
% of Global Catch	31%	43%		32%	43%		32%	43%		31%	43%		39%	54%	
Average Price Kilo			$9.76			$8.91			$9.85			$10.54			$10.50

Sources: CCAMLAR Document SCIC-04/10; and National Marine Fisheries Service, Fisheries Statistic Division, Silver Spring MD

[Insert Table 18 (Sec. 3.2) here: "U.S. Imports of Toothfish (*Dissostichus spp*.) Total Frozen and Fresh Product by Volume" from PDF file named "U.S. Imports of Toothfish by Volume and Value"]

[Insert Table 19 (Sec. 3.2) here: "U.S. Imports of Toothfish (*Dissostichus spp*.) Total Frozen and Fresh Product by Value" from PDF file named "U.S. Imports of Toothfish by Volume and Value"]

3.3 Habitat

The Southern Ocean surrounds the continent of Antarctica and is bounded to the north by the Antarctic Convergence Zone (ACZ). The ACZ is formed where the cold waters of the Antarctic meet warmer waters to the north and acts as an effective biological barrier, preventing species from crossing it and making the Southern Ocean a substantially closed ecosystem. The Southern Ocean is an old system with a long evolutionary history; the main circulation patterns and water mass distributions were established about 20 million years ago. Covering an area roughly twice the size of the United States (20.3 million square kilometers) and 18,000 kilometers of coastline, it is the largest marine ecosystem and the fourth largest ocean in the world. The vast size and inhospitable conditions of the Southern Ocean make enforcement of CCAMLR measures and prevention of IUU fishing logistically difficult.

Bathymetry

The Southern Ocean is deep, reaching 4,000 to 5,000 meters over most of its area with only limited areas of shallow water. A maximum depth of 7,235 meters is found at the southern end of the South Sandwich Trench. The continental shelf around Antarctica is generally narrow and unusually deep compared to other ocean shelves. The shelf is between 64 and 240 kilometers wide, and is cut in places by numerous valleys and basins. The edge of the shelf lies at depths of 400 to 800 meters, while the global average is 133 meters. A series of underwater ridges and rises to the north of the continent restricts the free flow of bottom water and in some areas may even deflect surface currents. Marine sediments in the Southern Ocean are poorly sorted and consist of muds, fine and coarse sands, pebbles, and small and large boulders that have been gouged from the underlying land surface as ice moves off of the continent. As this ice melts, materials are deposited onto the ocean floor at a rate of about 500 million mt each year. The northern limit of this type of bottom sediments coincides with the average northern extension of pack ice. North of that area is a wide belt (1,000 to 2,000 kilometers) of diatomaceous ooze (build-up consisting of the remains of phytoplankton, primarily diatoms) settled out from surface waters that results from primary phytoplankton production at the seasonal pack ice edge. Ice plays a major role in shaping Antarctic bottom structure, with icebergs scouring benthic habitats and ploughing furrows down to 400 meters depth. The margin around Antarctica is home to several non-living oceanic resources, including possibly large oil and natural gas fields, manganese nodules (a source of manganese, cobalt, and nickel), possible placer deposits (concentrations of valuable minerals), and sand and gravel deposits.

Climate

Antarctica is subject to harsh and often unpredictable weather conditions. The climate of the Southern Ocean has shown a high degree of stability, changing little over the past 3 million years. The atmospheric circulation around Antarctica forms two broad bands that are divided by the Circumpolar Trough at 65 degrees south. The Trough is characterized by highly variable and mostly clockwise atmospheric flow. The

Circumpolar Trough separates a zone of westerlies to the north and polar easterlies to the south, close to the continent. The zone of westerlies, particularly the area between 40 degrees south and the Antarctic Circle, has the strongest average winds found anywhere on earth. The zone of polar easterlies often experiences intense cyclonic storms traveling around the continent due to the large temperature contrast between the pack ice and the open ocean. As a result, much of the area experiences high winds and large waves much of the year.

Sea ice plays a large role in the Southern Ocean climate because of the positive feedback between the extent of the ice and surface albedo (the fraction of incident electromagnetic radiation reflected by a surface; ice reflects more than open ocean). Due to the large amount of sea ice, the climate over the Southern Ocean is actually more characteristic of continental ice sheets than a marine environment. In addition to harsh temperatures and winds, the Southern Ocean habitat is also exposed to increasing amounts of solar radiation as a result of the Antarctic ozone hole that has developed in recent years. This increased solar radiation is suspected of reducing primary (plant) productivity by as much as 15%.

Ice Cover

Sea temperature ranges between –2 and 10 degrees Celsius in the Southern Ocean. In winter, the ocean surface freezes outward to about 65 degrees south in the Pacific sector and 55 degrees south in the Atlantic sector, lowering the surface temperature to well below 0 degrees Celsius. Many areas become entrapped by the developing 500 to 1,500 kilometer-wide belt of ice, though some points along the Antarctic coast are kept free of ice throughout the winter by intense and persistent drainage winds from the interior. During the austral summer, the ice belt can still be about 150 to 800 kilometers wide in many areas, isolating the continent from warmer waters. The ice free zone in the Antarctic ranges between 40 and 85% depending on the time of year. About 1/3 of the coastline of Antarctica is made up of ice shelves, floating ice fed by glaciers emanating from the vast polar plateau and by snowfall upon their surfaces. Moving seaward at rates of up to one meter per day, these ice shelves can be up to 300 meters thick on their seaward edges and have a large influence on near shore circulation and water properties. Land fast ice (attached to the land or ice shelves) can extend up to 50 kilometers outward and may be up to 3 meters thick. Sea ice originating on or at the edge of the polar land mass is dispersed quickly (up to 65 kilometers per day) by strong winds blowing northward into the surrounding Southern Ocean. Huge icebergs with drafts up to several hundred meters, smaller icebergs, and iceberg fragments originate in this area as well, breaking off of the floating ice shelves that have been weakened by wave exposure.

The seasonal icepack grows from an average minimum of about 2.6 million square kilometers in March to 18.8 million square kilometers in September, with about 85% of the pack melting and reforming each year. The advance of the ice in May and June occurs at a rate of 4.2 million square kilometers per month, while the ice retreats at 6.9 million square kilometers per month in November and December. Only in very limited areas of the Southern Ocean (Weddell Sea and parts of the Ross, Amundsen, and Bellingshausen Seas) does multi-year ice form. Even in such areas, the residence time of ice is generally limited to 2 to 3 years. The ice edge is a dynamic zone that responds rapidly to physical forcing (ocean circulation and local winds) and there are large annual and inter-annual and sometimes dynamic short-term variations in the formation and extent of the icepack. Ice, driven by winds and ocean currents, is in almost continual motion and moves in a generally clockwise direction around the continent. Antarctic sea ice is characterized by minimal surface melting and an absence of melt ponds due to the low atmospheric relative humidity in the region. Thus, it is heat from the water that is largely responsible for the seasonal ice retreat; higher biological activity in the ice enhances internal melting by weakening the ice and accelerating break-up.

Pack ice is generally 0.5 to 1 meter thick, with a very rugged bottom that forms an unusual and highly specialized habitat in which many organisms thrive. Sea ice is inhabitable by microscopic plants and animals, which can grow so successfully and in such high numbers that they may stain the underside of the ice a dark brownish green. This serves as an important feeding habitat for a variety of animals during the winter months. In spring, as the ice melts, organisms that have grown and reproduced within the ice are released and a large phytoplankton bloom occurs. As the ecological interface between the open-ocean and pack ice communities, the zone at the ice edge teems with life in the summer when large numbers of animals come there to feed. The zone of melting ice and shelf waters are responsible for ~40% of the total primary production in the Southern Ocean, and almost all of the new production. Sea ice has such a profound influence on productivity that the four ecosystem types (Ice-Free, Seasonal Pack Ice, Permanent Pack Ice, and Zone-independent areas) in the Southern Ocean are related to ice cover.

Circulation Patterns and Water Masses

The Southern Ocean is comprised of three separate and distinct water masses: Antarctic Surface Water, Circumpolar Deep Water, and Antarctic Bottom Water. On the continental shelf around Antarctica, 2 water masses exist: Surface Shelf Water and a modified version of Circumpolar Deep Water. The boundaries between these water masses are sharp and the differing characteristics drive circulation patterns. Antarctic Bottom Water is formed when cold and fresher seawater sinks to the ocean floor as ice shelves melt. It represents the coldest and densest water in the world, and fills much of the deep World Ocean. After sinking to the ocean floor, it moves north, adding oxygen and reducing temperatures of receiving waters in tropical and temperate seas. This cooling effect reaches waters of the Northern Hemisphere and shows the major role that Antarctic waters play in the world's transfer of heat and energy.

Antarctic Surface Water originates near the Antarctic continent and flows north. When it meets Sub-Antarctic Surface Water at the ACZ, it sinks beneath the less-dense Sub-Antarctic water and mixes with the underlying water mass (Sub-Antarctic Intermediate Water). North of the ACZ, waters are warmer and saltier, while waters south of the ACZ (in the Southern Ocean) are colder and less salty. Circumpolar Deep

Water is upwelled to the surface at the Antarctic Divergence Zone, an area closer to the continent than the ACZ where water flows up from the bottom and then the flow splits at the surface. Once Circumpolar Deep Water reaches the surface, it mixes with surface waters and moves both south towards the continent and north away from it.

Surface current patterns closely follow atmospheric circulation due to an absence of atmospheric or oceanic barriers. North of the Circumpolar Trough at about 1500 kilometers off the coast of Antarctica, prevailing westerlies drive surface currents to the east in the Antarctic Circumpolar Current (West Wind Drift). The Antarctic Circumpolar current intensifies after it moves through a constriction in the Drake Passage, becoming one of the strongest currents in the world and reaching speeds of ½ knot, or about 4 times the speed of the Gulf Stream in the Atlantic Ocean. Covering a distance of 21,000 kilometers and transporting about 130 million cubic meters of water per second (100 times the flow of all the world's rivers combined), the Antarctic Circumpolar Current is also the largest current in the world. South of the Circumpolar Trough, easterly winds drive the westward-flowing Antarctic Coastal Current (East Wind Drift). This current generally follows the coastline, but low pressure cells along the continental margin cause several circulation gyres, including the large Ross Sea and Weddell Gyres. East-west transport by the Antarctic Coastal Current and the Antarctic Circumpolar Current dominates over north south transport by the movement of Antarctic Bottom Water.

Because of its effect on water temperature and salinity, sea ice plays an important role in the formation and movement of Antarctic water masses. When sea ice forms, it takes up only about 15% of the salt in seawater, leaving the remaining waters salty and dense. As ice melts, it releases large amounts of freshwater, reducing the salinity of surface waters at the ice edge or under perennial sea ice cover. Lower salinity water is less dense and floats on top of saltier water bodies, creating an oceanographic front with enhanced vertical stability. Except at the ice edge during retreat, the Southern Ocean is well mixed and features no pronounced stratification or vertical stability due to the continual sinking of dense water near the continent and upwelling of water at the Antarctic Divergence Zone. This vertical stratification provided by the melting ice has profound effects on primary production and food web dynamics by allowing phytoplankton to remain in the high light, high-nutrient surface waters.

3.4 Potential Fishery Interactions with Protected Species in the Convention Area (including those under the Endangered Species Act and Marine Mammal Protection Act)

Observation of incidental mortality of marine mammals and birds is a priority item for CCAMLR. All marine mammal interactions with, and seabird bycatch by, vessels fishing in the Convention Area are reported to the CCAMLR Data Manager and discussed annually by the CCAMLR Ad-hoc Working Group on Incidental Mortality Associated with Fishing (WG-IMAF).

3.4.a. Cetaceans

A. Toothfish Fishery

Some marine species or stocks identified as either endangered or threatened under the Endangered Species Act (ESA) are found in the nutrient-rich waters of the CCAMLR Convention Area and those areas of high seas or of national jurisdiction where toothfish fisheries occur. The primary cetacean species that are found in these waters include: minke, Bryde's, fin, sei and blue whales.

Toothfish consumption by whales

Two species of Dissostichus are known and both have a circumpolar distribution: *Dissostichus eleginoides* (Patagonian toothfish) occurs in sub-Antarctic and cool temperate waters; *D. mawsoni* (Antarctic toothfish) is found in the southerly waters of the Antarctic. Based on CCAMLR international observer reports, sperm whales and killer whales consume toothfish in CCAMLR Division 58.5.2 and 58.4.3 due to interactions with fisheries (see Table 20). More specifically for killer whales, Type C (inhabits inshore waters and lives mainly in the pack-ice; it occurs mostly off East Antarctica) has been observed consuming Antarctic toothfish. The amount of toothfish consumed by individual cetaceans or by cetacean populations was not found in the literature.

Interaction of whales with toothfish vessels

Each vessel participating in an exploratory fishery for *Dissostichus* species in the CCAMLR Convention Area is required by CCAMLR conservation measures to have one scientific observer appointed in accordance with the CCAMLR Scheme of International Scientific Observation (CCAMLR scientific observer), and where possible one additional scientific observer, on board throughout all fishing activities within a fishing season. Scientific observers are required to carry out their duties as specified in the CCAMLR Scientific Observers Manual. There are four parts to the manual: Planning Scientific Observations; Logbook Forms and Instructions for Recording Results of Scientific Observations on Commercial Fishing Vessels; Guidelines for Scientific Observers; and Reference Materials. These sections are very detailed as to observer duties. Section 9 of the manual, Summary of Marine Mammal Observations, has three subsections. Subsection 9.1 addresses Marine Mammal Entanglement; 9.2 Mitigation Measures; and 9.3 Fish Loss Due to Marine Mammals, including space for "Comments, including interactions between and within species, interactions with the vessel and fishing gear, as well as the abundance of all species of marine mammals observed during the cruise." All scientific observer reports and comments are received and reviewed by the CCAMLR Ad hoc Working Group on Incidental Mortality Associated with Fishing.

Toothfish fisheries are primarily longline, but there are also trawl fisheries in subareas 58.5.2 and an exploratory trawl fishery in 58.4.3. During the 2001/02 fishing season, seven vessels conducted 10 trawl operations targeting finfish within the

CCAMLR Convention Area. As required by the Commission, all trawlers fishing for finfish carried scientific observers. There have been no reports of interactions with cetaceans and the finfish trawl fisheries; however, there have been reports of interactions of sperm and killer whales with the longline fisheries. No confirmed instance of mortality associated with the toothfish fishery has been reported.

A 2004 report by a CCAMLR scientific observer on board a U.S. longline vessel recorded interactions between sperm whales throughout the fishing season, citing 2-4 whales normally present during each haul. In comments annotating the report, the observer noted two possible sperm whale mortalities and assessed the impact of the fishery on sperm whales as negligible overall. Interactions between toothfish longline fisheries and sperm and killer whales from 1999-2001 are summarized below in Table 20.

According to the WG-FSA 1999 Report, interactions between longline vessels and marine mammals appear to be increasingly reported by scientific observers. Sperm whale depredation on longlines may be a learned behavior that begins when the whales associate fishing operations with a feeding opportunity (Hill *et al*., 1999). An unidentified dolphin was hooked in Subarea 48.3 but released itself and sperm whales were temporarily entangled on two occasions in longlines in Subareas 58.6 and 58.7 during the 1998/99 fishing season.

In addition to the killer and sperm whale interaction listed in Table 20, the WG-FSA 2000 reported interactions between killer whales, sperm whales and a longline vessel fishing around the Falkland/Malvinas Islands. The interactions reported were complex and restricted to the time of line hauling. Nevertheless, all available evidence indicated that the whales were not taking fish from the line.

In the WG-FSA 2002 Report, interactions with marine mammals resulting in a potential loss of fish were reported in Subareas 48.3, 58.6 and 58.7 and Division 58.4.4. No such interactions were reported for Subarea 88.1 despite sightings of killer whales from the fishing vessels.

In the WG-FSA 2003 Report, interactions between cetaceans and longline finfish fisheries in Subarea 48.3 were summarized between 2000 and 2002. This indicated that sperm whales were recorded during 24% of hauling operations and killer whales, the second most abundant cetacean species, were recorded during 5% of hauls. Catch rates were significantly lower when killer whales were present when compared to hauls with no cetaceans present. The same trend was, however, not observed for catch rates when sperm whales were present during hauling. Sperm whales were likely attracted to areas with high catch rates, but in areas with lower catch rates indications are that depredation by sperm whales can lead to a drop-off in catches. The authors suggested that further investigations are needed to determine the extent of longline–cetacean interactions, to address the problems of longline–cetacean depredation, to standardize observer protocols to ensure the collection of valuable data, and to assess and implement mitigation strategies under controlled experimental conditions. (CCAMLR, 2002)

WG-FSA-03/95 used observer data from Chilean waters adjacent to the Convention Area to quantify the level of sperm and killer whale interactions with demersal longliners. Based on the frequency of toothfish lips and heads hauled, the authors estimated that around 3% of toothfish are taken from the line by sperm and killer whales. The authors also suggested that sperm whales that congregate around toothfish longliners may be susceptible to an increased level of attack by killer whales, although the magnitude of this problem has not been quantified. Dr Micol reported that the documented decline in the number of killer whales in Subarea 58.6 was considered, at least in part, to be a result of the use of firearms and explosive deterrents by IUU longline vessels. (CCAMLR, 2002)

It appears that the interactions between the toothfish longline fisheries and sperm and killer whales are more of a detriment to the fishers than to the whales, since sperm and killer whales are removing fish from the longlines. Fishers will often move to locations where sperm and killer whales are not in order to have higher catch rates (CCAMLR, 2002).

During the 2003/04 season, fishers reported vessel interactions with 4 sperm whales removing fish from longlines in Subarea 88.1. He also observed killer whales, but had no interactions with them.

Table 20 (Sec. 3.4.a.): Interactions between marine mammals and longline vessels fishing for toothfish, taken from WG-FSA-02/12 Rev. 1 and reports of scientific observers.

Subarea	Year	Cruises where Interaction Occurred	Killer Whale	Sperm Whale	Unknown
Subarea 48.3	1999	13 of 17	12	1	0
	2000	9 of 26	6	3	1
	2001	11 of 15	5	4	0
Subareas 58.6/58.7	1999	9 of 12	6	4	3
	2000	9 of 11	7	6	2
	2001	1 of 3	1	0	0

Information on an artisanal fishery for toothfish off Chile was presented at a meeting by Edu Secchi on behalf of Eduardo Gonzales and Carlos Olavarria. Risso's dolphins, southern right whale dolphins and sperm whales were seen during the surveys; however, only sperm whales interacted with this fishery during this preliminary study. Although the results indicate that the losses caused by the interaction with sperm whales are negligible, fishers have informed about their attempts to keep the whales away from the fishing gear using extreme methods, e.g., shooting and harpooning the whales. One whale has been reported dead due to entanglement in the line

B. Icefish Fishery

<u>Icefish Consumption by whales</u>

Although brief reports were found on the consumption of icefish by land mammals in the Antarctic; there were no reports found on consumption of icefish by cetaceans. It was stated in the CCAMLR *Report of the workshop on approaches to the management of icefish* (Hobart, Australia, 3 to 5 October 2001) that more information is required on impacts of the icefish fishery on predators.

<u>Interaction of whales with icefish vessels</u>

No interactions were found reported on cetaceans and the icefish fishery.

C. Krill Fishery

Some marine species or stocks identified as either endangered or threatened under the Endangered Species Act (ESA) are found in the waters of the CCAMLR Convention Area and those areas of high seas or of national jurisdiction where the krill fisheries occur. Marine mammal species that are listed under the ESA are found in these waters, including six species of large whales: blue, fin, humpback, right, sei, and sperm whales. There are no reported interactions by ESA-listed whale species with krill trawl gear in any of the Convention Area fisheries.

<u>Krill consumption by whales</u>

Everson (1984) estimated the annual consumption of krill throughout the Southern Ocean by baleen whales at 43 million tons, by seals at 128 million tons, by birds at 33 million tons, possibly 100 million tons by squid, and an unknown but substantial quantity by fish. Miller and Hampton (1989) estimated that whales, birds, pinnipeds, fish, and squid together consume 250 million mt of Antarctic krill annually. Everson and de la Mare (1996) indicate that reasonable estimate of krill consumption of Antarctic krill by natural predators is between 150 and 300 million mt.

Other gross estimates of consumption of euphausiids by marine mammals in the North Pacific, the Atlantic and the Southern Hemisphere note consumption of euphausiids specific to species, abundance, average body width (in tons), summer ingestion rate, feeding period, percentage of krill in diet and krill consumed (in tons). Estimates of stock abundances were obtained from working papers and reports of the International Whaling Commission, NMFS reports, and the primary literature. Total consumption of euphausiids by marine mammals is on the order of 125-250 million tons per year in the Southern Hemisphere, with the bulk of the latter being consumed in the Southern Ocean. Of the estimated total krill consumption by baleen whales in the Southern Ocean, two species of minke whales consume approximately two-thirds. Crabeater seals consume more krill than any other marine mammal population in the world (Hewitt and Lipksy, 2002).

Fin and minke whales consume several species of krill in the Southern Ocean throughout the austral summer. The numerically dominant euphausiid in the Southern Ocean is consumed in all areas of the Southern Ocean. Southern right whales have been observed foraging on *E. superba* in the Atlantic sector of the Southern Ocean. Humpback whales have been frequently observed foraging on *E. superba* in bays and fjords along the Antarctic Peninsula. Generalizations from this data include: (1) blue and fin whales appear to have a higher preference for euphausiids than minke, humpback, or bowhead whales; (2) sei and Bryde whales appear to be more opportunistic feeders; and (3) crabeater seals have a higher preference for euphausiids than other seals in the Southern Ocean. (Hewitt and Lipsky, 2002).

Krill abundance can vary dramatically over relatively short periods of time. Baleen whales have adapted to this variability. Their size and ability to accumulate substantial energy stores allow them to integrate over large distances and periods of time in their search for food. Their longevity allows them to spread reproductive effort over several years (Hewitt and Lipsky, 2000). It may be reasonable to expect that whale reproductive output might decline during periods of poor krill availability, but they have evolved life-history strategies to deal with this (Hewitt, <u>pers</u>. <u>comm</u>.).

The estimates cited in the sections on krill biomass and krill consumption indicate that, on average, annual demand for krill by natural predators is nearly double the standing stock. This is possible because the production to biomass (P/B) ratio of krill is approximately 2 to 1. In other words, the reproduction and growth rates of krill result in a production of krill on an annual basis that exceeds the standing stock by approximately 2 to 1 (Hewitt, <u>pers</u>. <u>comm</u>.). This ratio is in agreement with estimates of the P/B for *E. superba* obtained using other approaches (Miller and Hampton 1989).

<u>Interaction of whales with krill vessels</u>

There have been no reports by CCAMLR Scientific observers of whale interactions with or entanglements in krill trawl gear. The NMFS Antarctic Ecosystem liaison to U.S. vessels fishing for AMLR noted that he has not received any reports from observers aboard the U.S. vessel fishing for krill during its four years of fishing in Area 48 of any gear interactions with whales or whale sightings (Jones, pers. comm. E-mail). Most recently, in 2003, a krill trawler in Subarea 48.3 reported no interactions with cetaceans.

3.4.b. Seabirds

Introduction

A description of the pertinent natural history of each seabird species in the waters managed by parties to CCAMLR is described in Sec. 3.1.d. This Sec. 3.4.b. describes other baseline conditions of seabirds (all are migratory birds occurring in the Convention Area and the Amsterdam albatross (*Diomedea amsterdamensis*) is listed under the U.S. Endangered Species Act) as they relate to the Southern Ocean fishery managed by Federal authorities in cooperation with the international agreements through CCAMLR. These accounts summarize the human and natural impacts on each species, to the extent that they are known, and thus (in conjunction with Sec. 3.1.d.) provide the historical and scientific basis for analyzing the potential impacts of the alternatives described in Section 4. Where possible, information common to most or all relevant seabird species is described in the introduction.

The geographic and temporal scope of material presented in Sections 3.1.d. and 3.4.b. are not consistent among species because their distributions and availability of data on the species varies greatly.

Vessels operating in the CCAMLR Convention Area using either longline or trawl gear have been documented to incidentally take seabirds (Table 21 provides a complete list of references). No incidental takes of seabirds have been documented by vessels using pot or jig gear in the CCAMLR Convention Area. Many species of seabirds are known to interact with commercial fishing vessels, particularly vessels deploying longline gear (NMFS 2001). Longline gear is generally deployed from the vessel's stern, with the main line and attached hooks following the vessel in a downward sloping diagonal line until it enters the water. The baited hooks on this main line remain in the air or near the water surface and are accessible to seabirds for varying times and distances depending on the size of the vessel, sea conditions, gear deployment equipment and methods, and the specific longline gear configuration.

Longline fishing vessels also discharge offal in the form of discarded fish, fish scraps from cleaned fish, and used or discarded bait. The availability of "free" food in the form of offal and bait attracts seabirds to longline fishing operations. Most seabirds killed during longline operations are attracted to the baited hooks when the gear is being set. The birds are sometimes accidentally hooked or entangled while feeding on baits near the surface and are dragged underwater and killed by drowning or by strangulation. Birds are also hooked or entangled during the haul back process but these birds are usually released alive.

The factors potentially affecting seabird hooking and entanglement on longline gear are complex and include geographic location of fishing activity, time of day, season, type of fishing operation and gear used, bait type, condition of the bait (frozen, thawed, dyed), length of time baited hooks remain at or near the surface of the water, water and weather conditions, availability of food (including bait and offal), bird size, bird behavior (feeding and foraging strategies), and physical condition of the bird. Most seabird species probably interact with longline fishing gear; however, only the larger species have the physical capabilities and feeding strategies to face frequent interactions and potential hookings.

In order to assess and monitor the incidental mortality of birds and marine mammals, CCAMLR in 1984 requested that its Members keep records and report the number, species, and where appropriate the age, size, sex and reproductive status of any birds and marine mammals taken incidentally during fishing operations.

In 1992, the CCAMLR established the Ad hoc Working Group on Incidental Mortality Arising from Longline Fishing (WG-IMALF). The group's terms of reference included the review of data on seabird bycatch and the performance of CCAMLR seabird-related measures. In 2001, taking into account that the group also considers incidental mortality associated with trawl fishing, the name of the group was amended to the Ad hoc Working Group on Incidental Mortality Associated with Fishing (WG-IMAF). The group's advice is submitted annually to the CCAMLR Scientific Committee for consideration.

In 1989, CCAMLR noted that the introduction of longline fishing in the Convention Area posed a potential threat to seabirds. CCAMLR has mounted a major campaign, directed by WG-IMALF, to reduce the incidental capture and mortality of seabirds in longline fisheries. In 1989, CCAMLR adopted Resolution 5/VIII "Protection of seabirds from incidental mortality arising from longline fishing". In 1991, CCAMLR adopted the Conservation Measure 29/X "Minimisation of the Incidental Mortality of Seabirds in the Course of Longline Fishing or Longline Fishing Research in the Convention Area" which has subsequently been modified to include a suite of measures designed to prevent, or minimise, the incidental mortality of seabirds. CCAMLR keeps these actions under annual review.

CCAMLR adopted a Scheme of International Scientific Observation in 1992. Observation of incidental mortality of marine mammals and birds is a priority item under the Scheme. International scientific observers are now mandatory for all vessels fishing in the Convention Area. In a number of coastal state Exclusive Economic Zones within the Convention Area, national observers also collect data. Guidelines and instructions for observations are published in the CCAMLR Scientific Observers Manual. The manual is available at http://www.ccamlr.org/pu/e/pubs/obsman03.pdf

Scientific observations of seabirds and marine mammals are carried out on board longline vessels with the following objectives:

(i) to document and quantify seabird catch rates and determine the specific identity, age and sex of all birds caught; (ii) to assess the relative vulnerability of different seabird species; (iii) to monitor the mortality of seabirds per unit of fishing effort; (iv) to document all aspects of a vessel's fishing strategy, methods and equipment which have an impact on seabirds and marine mammals; (v) to assess the effectiveness of CCAMLR measures aimed at reducing the incidental mortality of seabirds; (vi) to ascertain what, in terms of a vessel's fishing operations, contributes to the bird catch rates observed, and to collect data relevant to factors that influence bird catch rates; (vii) to estimate the abundance of marine mammals and record their interactions with longline fishing operations; (viii) to document data on catch rates of fish, wherever this is relevant to the assessment of seabird and marine mammal interactions; and (ix) to collect and retain biological samples. Observers also should take counts of the abundance of all birds by species at 30-minute intervals throughout setting.

CCAMLR manages fisheries in the Convention Area on a seasonal basis, from December 1 following the annual Fall meeting of the Commission to November 30 of the next year. Individual fisheries within a season may be for lesser periods than a full year. The krill fishery, however, is open for the entire year.

All seabird and marine mammal interactions with vessels fishing in the Convention Area are reported to the CCAMLR Data Manager and discussed annually by the WG-FSA. Since 1995, two scientific observers, one of whom must be an observer appointed in accordance with the CCAMLR Scheme of International Scientific Observation, are required in all exploratory fisheries for toothfish in the Convention Area throughout all fishing activities within the fishing season.

Additional CCAMLR information about the incidental effects of fishing can be found at http://www.ccamlr.org/pu/e/sc/imaf/ie-intro.htm

The work of WG-IMAF continues to focus on determining the status of seabirds vulnerable to the impact of longline fishing, evaluating the impact of new and exploratory fisheries in the Convention Area, assessing incidental mortality of seabirds during regulated and illegal, unregulated, and unreported (IUU) fisheries in the Convention Area and adjacent waters and reviewing research into and experience with mitigating measures.

Assessments were undertaken in 1997 to evaluate the magnitude of potential risk of bycatch of albatrosses and petrels in the divisions and subareas of the CCAMLR Convention Area. The assessments are reviewed annually and revised to incorporate new information as it becomes available. The annual assessments are conducted by CCAMLR's working group on IMAF. IMAF was requested to relate the assessments to the timing of fishing seasons, the need to restrict fishing to nighttime, and the magnitude of general potential risk of bycatch of albatrosses and petrels. Based on the IMAF risk assessments, the Commission may annually adopt measures to prohibit longline fishing in specified CCAMLR subareas and divisions during the main albatross and petrel breeding season. Closures are in place in Subarea 48.3 from September 1 to April 1.

Over the past five years the total seabird bycatch and rate of bycatch in regulated fisheries in the Convention Area has been significantly reduced. This has been achieved by a combination of improved compliance with Conservation Measure 25-02 and by delaying the start of fishing until the end of the breeding season of most albatross and petrel species.

By 2001, the operation of regulated longline fisheries in the Convention Area had achieved negligible levels and rates of seabird bycatch in Subarea 48.3, low levels in the South African exclusive economic zone (EEZ) in Subareas 58.6 and 58.7 and no incidental mortality in Subarea 88.1 for the fourth successive year. In 2002, the Scientific Committee noted that, based on reported data, levels of seabird bycatch in the Convention Area had been the lowest ever recorded. Thus, in the Convention Area, the only remaining seabird bycatch problem in regulated fisheries is in the French EEZs in Subarea 58.6 and Division 58.5.1.

In addition to requiring the use of an appropriate suite of measures to minimize seabird bycatch in regulated fisheries, CCAMLR also considers the advice of WG-IMAF for all proposed new and exploratory fisheries. Each year WG-IMAF reviews these proposals and, taking account of the magnitude of potential risk of seabird bycatch in each area concerned, recommends the appropriate suite of mitigation measures (considering especially the need for fishing season restriction and night setting of longlines).

In terms of fishery-related threats to seabirds in the Convention Area, CCAMLR recently endorsed the advice of WG-IMAF and the Scientific Committee that the main threats are now posed by bycatch in IUU fishing in the Convention Area and by bycatch in longline fisheries adjacent to the Convention Area.

<u>Assessment of population level effects:</u>

Due to the longevity of most seabirds and their reliance on high adult survival, rather than fecundity, to maintain a stable population, effects on the population are difficult to discern in the short term. Population level effects resulting from incidental mortality in fisheries have been suggested for several seabirds, including the Wandering albatross, Yellow-eyed penguin, White-chinned petrel, and African penguin (Croxall *et al.* 1990, Darby and Dawson 2000, Barnes *et al.* 1997, Crawford in press and in WG-EMM-04/28; also see Brothers 1991, Murray *et al.* 1993).

Direct mortality from incidental take in regulated fisheries

<u>Direct mortality from incidental take in **longline** fisheries</u>:

Incidents of bycatch in regulated fisheries are summarized to the extent possible in Table 21. The 20 species of seabirds that were identified by WG-IMAF as being most at risk from longline fisheries in the Convention Area are numbered in Table 21. From 1997 to 2003, the bycatch rate (number of birds/1,000 hooks) has been reduced from 0.23-0.52 to 0.0003 (Table 22). By 2001, the operation of regulated longline fisheries in the Convention Area had achieved negligible levels and rates of seabird bycatch in Subarea 48.3, low levels in the South African EEZ in Subareas 58.6 and 58.7 (Table 22). In 2002, the Scientific Committee noted that, based on reported data, levels of seabird bycatch in the Convention Area had been the lowest ever recorded. For Subarea 48.3 the total estimated seabird bycatch in 2003 was only 8 birds at a rate of 0.0003 birds/1,000 hooks, even lower than the values of the last three years; bycatch was slightly higher in 2004 with 18 birds caught at a rate of 0.001 birds/1,000 hooks. No incidental mortality of seabirds was observed in Subarea 88.1 in 2003, for the 7th successive year. In 2004, 1 Southern Giant Petrel was killed in Subarea 88.1. In 2004, there was no seabird mortality in Subarea 88.2 and Divisions 58.4.2 and 58.5.2, presumably due to strict compliance with conservation measures. Overall in 2003, only 15 birds were estimated to be killed in the regulated longline fisheries, and in 2004 58 birds were killed in the regulated longline fisheries (with the exception of the French EEZ). The 2003 level was the lowest level ever recorded and bycatch rates in 2003 and 2004 were negligible in respect of impact on the seabird populations concerned. A document on CCAMLR's work on the elimination of seabird mortality associated with fishing can be found at http://www.ccamlr.org/pu/e/sc/imaf/docs/bg-text.pdf. CCAMLR's efforts to develop and implement effective seabird avoidance measures for longline vessels have proven to be successful with increasingly high vessel compliance with these measures and continued reductions in seabird bycatch. Seabird bycatch by regulated vessels in many CCAMLR areas has been reduced to negligible levels.

At its 2003 annual meeting, CCAMLR adopted revisions to **Conservation Measure 25-02**[1, 2] based on IMAF advice to CCAMLR's Scientific Committee. Those revisions remain in effect and require longline vessels to abide by the following requirements:

1. Fishing operations shall be conducted in such a way that hooklines[3] sink beyond the reach of seabirds as soon as possible after they are put in the water.

2. Vessels using autoline systems should add weights to the hookline or use integrated weight hooklines while deploying longlines. Integrated weight (IW) longlines of a minimum of 50 g/m or attachment to non-IW longlines of 5 kg weights at 50 to 60 m intervals are recommended.

3. Vessels using the Spanish method of longline fishing should release weights before line tension occurs; weights of at least 8.5 kg mass shall be used, spaced at intervals of no more than 40 m, or weights of at least 6 kg mass shall be used, spaced at intervals of no more than 20 m.

4. Longlines shall be set at night only (i.e., during the hours of darkness between the times of nautical twilight[4])[5]. During longline fishing at night, only the minimum ship's lights necessary for safety shall be used.

5. The dumping of offal is prohibited while longlines are being set. The dumping of offal during the haul shall be avoided. Any such discharge shall take place only on the opposite side of the vessel to that where longlines are hauled. For vessels or fisheries where there is not a requirement to retain offal on board the vessel, fish hooks should be removed from offal and fish heads prior to discharge.

6. Vessels which are so configured that they lack on-board processing facilities or adequate capacity to retain offal on board, or the ability to discharge offal on the opposite side of the vessel to that where longlines are hauled, shall not be authorized to fish in the Convention Area.

7. A streamer line shall be deployed during longline setting to deter birds from approaching the hookline. Specification of the streamer line and its method of deployment is given in the appendix to this measure.

8. A device designed to discourage birds from accessing baits during the haul of longlines shall be employed in those areas defined by CCAMLR as average-to-high or high (Level of Risk 4 or 5) in terms of risk of seabird bycatch. These areas area currently Subareas 48.3, 58.6 and 58.7 and Divisions 58.5.1 and 58.5.2.

9. Every effort should be made to ensure that birds captured alive during longlining are released alive and that wherever possible hooks are removed without jeopardizing the life of the bird concerned.

Appendix to Conservation Measure 25-02:

1. The aerial extent of the streamer line, which is the part of the line supporting the streamers, is the effective seabird deterrent component of a streamer line. Vessels are encouraged to optimize the aerial extent and ensure that it protects the hookline as far astern of the vessel as possible, even in crosswinds.

2. The streamer line shall be attached to the vessel such that it is suspended from a point a minimum of 7 m above the water at the stern on the windward side of the point where the hookline enters the water.

3. The streamer line shall be a minimum of 150 m in length and include an object towed at the seaward end to create tension to maximize aerial coverage. The object towed should be maintained directly behind the attachment point to the vessel such that in crosswinds the aerial extent of the streamer line is over the hookline.

4. Branched streamers, each comprising two strands of a minimum of 3 mm diameter brightly colored plastic tubing [6] or cord shall be attached no more than 5 m apart commencing 5 m from the point of attachment of the streamer line to the vessel and thereafter along the aerial extent of the line. Streamer length shall range between minimums of 6.5 m from the stern to 1 m for the seaward end. When a streamer line is fully deployed, the branched streamers should reach the sea surface in the absence of wind and swell. Swivels or a similar device should be placed in the streamer line in such a way as to prevent streamers being twisted around the streamer line. Each branched streamer may also have a swivel or other device at its attachment point to the streamer line to prevent fouling of individual streamers.

5. Vessels are encouraged to deploy a second streamer line such that streamer lines are towed from the point of attachment each side of the hookline. The leeward streamer line should be of similar specifications (in order to avoid entanglement the leeward streamer line may need to be shorter) and deployed from the leeward side of the hookline.

Footnotes to Conservation Measure 25-02 and its Appendix:

1. Except for waters adjacent to the Kerguelen and Crozet Islands
2. Except for waters adjacent to the Prince Edward Islands
3. Hookline is defined as the groundline or mainline to which the baited hooks are attached by snoods.
4. The exact times of nautical twilight are set forth in the Nautical Almanac tables for the relevant latitude, local time and date. All times, whether for ship operations or observer reporting, shall be referenced to GMT.
5. Wherever possible, setting of lines should be completed at least three hours before sunrise (to reduce loss of bait to/catches of white-chinned petrels).
6. Plastic tubing should be of a type that is manufactured to be protected from ultraviolet

Additional CCAMLR information about the incidental effects of fishing can be found at http://www.ccamlr.org/pu/e/sc/imaf/ie-intro.htm

Direct mortality from incidental take by **trawls**:

Seabirds will also congregate around trawl fishing vessels to feed. Food may be in the form of fish offal (waste) that is discharged from the vessel's processing facilities or fish or fish pieces that can be retrieved during the trawl hauling process. A study of the New Zealand subantarctic squid trawl fishery documented significant mortalities of seabirds that collided with the trawl netsonde cables (Bartle, 1991). Birds have been observed sitting near the discharge chute and attempting to scavenge from the surface or surface dive for food (Williams and Capdeville, 1996). A study in the Kerguelen Islands area noted birds caught in the meshes of the upper front port near the headline of the trawl net or in the codend, during the setting or hauling process (Weimerskirch *et al*. 2000). Studies of finfish trawl fisheries of the Falkland Islands/Malvinas Islands have reported interactions of seabirds with the trawl warp cables and have noted this interaction as the primary cause of seabird mortality in the Falkland Island finfish fleet (Sullivan *et al.* 2003). Observations of trawling operations on vessels fishing for icefish in Subarea 48.3 noted birds congregating around fishing nets during shooting (deploying trawl net) and during hauling, frequently landing on the surface of the net to feed on fish caught in the net (Hicken and Everson 2003). Also noted was significant differences of operations between vessels, which can contribute to variability in interaction rates with seabirds.

The causes of seabird mortalities in trawl fisheries are varied and depend on the nature of the fishery (pelagic or demersal) and the nature and duration of processing discharge (Sullivan *et al*. 2003). Sullivan categorized the direct causes of trawl gear mortalities into two broad groups: (1) cable related mortality, which includes collisions with netsonde cables, warp cables and paravanes; and (2) net-related mortality, which includes all deaths caused by net entanglement.

For a number of years only occasional seabirds were reported as incidentally killed in trawl fishing operations in the Convention Area. In 1994, CCAMLR banned the use of trawl netsonde cables as seabirds were reportedly killed as a result of interactions with cables. This measure was later reinforced and trawl vessels were required to arrange the location and level of deck lighting so as to minimize illumination directed out of the vessel. The discharge of offal was also prohibited during the setting and hauling of trawl gear.

In 2001 trawlers fishing for mackerel icefish in Subarea 48.3 with bottom trawls reported a total of 132 seabirds entangled, three times the total estimated seabird mortality of all regulated longline fishing in this Subarea. In 2002, the bycatch level remained similar. In 2003, 15 incidents of seabird entanglement were recorded in the finfish trawl fishery in Division 58.5.2 and 43 incidents in the finfish trawl fishery in Subarea 48.3. In 2004, 87 incidents of seabird mortality were recorded in the finfish trawl fishery, and an additional 132 birds were released alive; all of the mortality occurred on vessels in Subarea 48.3. Although a decline in bycatch was observed through 2003, as measured by fewer numbers of birds than in previous years, the rate of interaction (birds per haul) does not appear to have been reduced substantially in this time period, and it actually increased in 2004.

In addition to mandatory requirements with Conservation Measure 25-03 (see below) to reduce interactions of seabirds with trawl vessels, Conservation Measure 42-01 requires trawl vessels in Subarea 48.3 to cease fishing if it takes 20 birds.

At its 2003 annual meeting, CCAMLR adopted revisions to **Conservation Measure 25-03** based on IMAF advice to CCAMLR's Scientific Committee. CM 25-03 remains unchanged for the 2004/05 season. It specifies that trawl vessels must comply with the following requirements (except for waters adjacent to the Kerguelen and Crozet Islands):

1. The use of net monitor cables on vessels in the CCAMLR Convention Area is prohibited.

2. Vessels operating within the Convention Area should at all times arrange the location and level of lighting so as to minimize illumination directed out from the vessel, consistent with the safe operation of the vessel.

3. The discharge of offal shall be prohibited during the shooting and hauling of trawl gear.

4. Nets should be cleaned prior to shooting to remove items that might attract birds.

5. Vessels should adopt shooting and hauling procedures that minimize the time that the net is lying on the surface of the water with the meshes slack. Net maintenance should, to the extent possible, not be carried out with the net in the water.

6. Vessels should be encouraged to develop gear configurations that will minimize the chance of birds encountering the parts of the net to which they are most vulnerable. This could include increasing the weighting or decreasing the buoyancy of the net so that it sinks faster, or placing colored streamers or other devices over particular areas of the net where the mesh sizes create a particular danger to birds.

<u>Seabird interactions with other fisheries in the Convention Area</u>:

There have been no reports by CCAMLR Scientific observers of seabird entanglements in krill trawl gear or crab pots. Drift net fishing is not allowed in the Convention Area.

CCAMLR regulates the harvest of crab species within the Convention Area and has set a total allowable annual catch of 1,600 tons. The fishery is limited to one vessel per member country; however, fishing activity has been minimal. In most years, there are no vessels participating in this fishery. In the 2002/03 fishing season one vessel harvested one ton of crab in Area 48.3.

Table 21 (Sec. 3.4.b.): Records of seabird mortality from fisheries bycatch. Bycatch is reported as year, site (CCAMLR Subarea if available); "other interactions," in most cases refers to tuna longline fishing vessels, but includes other longline fishing vessels, pot, jig, and set net fishing, and entanglement in fisheries related marine debris; citations of "CCAMLR YEAR," are from the records of CCAMLR observers on fishing vessels; a blank cell indicates no documented bycatch.

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
	Procellariiformes					
	Diomedidae	Albatrosses				
1	*Diomedea amsterdamensis*	Amsterdam albatross				
2	*Diomedea antipodensis*	Antipodean (wandering) albatross		NZ; Australia; Chile	1987-1998, NZ; Australia; Central Pacific; Chile	Robertson *et al*. 2003a, 2004; Murray *et al*.1993
3	*Diomedea epomophora*	Southern royal albatross	1996, CCAMLR	1990, NZ; Australia	NZ; Australia; Argentina; Indian Ocean; Atlantic Ocean	CCAMLR 1996; Bartle 1991; Robertson *et al*. 2003a, 2004
4	*Diomedea exulans*	Wandering albatross	1996, CCAMLR; 1997, 1998, CCAMLR (48.3, 58.7)	Weimerskirch *et al*. 1987 (58)	1989-1992, NZ; 1995 Brazil; 1996-1998, CCAMLR (58.7)	CCAMLR 1996, 1997, 1998; Murray *et al*.1993; Neves and Olmos 1998; Bartle 1990; Nel and Nel 1999
	Diomedea gibsoni	Gibson's albatross		Australia	NZ; Australia	Robertson *et al*. 2003a, 2004
5	*Diomedea sanfordi*	Northern royal albatross		NZ; Chile	NZ; Australia; Indian Ocean	Robertson *et al*. 2003a, 2004
6	*Phoebetria fusca*	Sooty albatross	1996, CCAMLR			CCAMLR 1996
7	*Phoebetria palpebrata*	Light-mantled (sooty) albatross	1997, CCAMLR (48.3, 58.7); 1998, CCAMLR (58.7)		NZ; Australia	CCAMLR 1997, 1998; Robertson *et al*. 2003a, 2004

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
8	*Thalassarche bulleri (Diomedea bulleri)*	Buller's albatross		NZ	1989-1992, NZ; Australia	Bartle 1991; Murray *et al*.1993; Robertson et al. 2003a, 2004
9	*Thalassarche carteri*	Indian yellow-nosed albatross				
	Thalassarche cauta (Diomedea cauta)	Shy albatross			1989-1992, NZ	Murray *et al*.1993
10	*Thalassarche chlororhynchos (Diomedea chlororhychos)*	Atlantic Yellow-nosed albatross	1997, 1998, CCAMLR (58.7); 2000, CCAMLR (58.6, 58.7)		1995, Brazil, demersal longline	CCAMLR 1997, 2000; Neves and Olmos 1998
11	*Thalassarche chrysostoma (Diomedea chrysostoma)*	Grey-headed albatross	1996, CCAMLR, 1997, CCAMLR (48.3, 58.7); 1998, CCAMLR (58.7); 1999, CCAMLR (48.3, 58.6, 58.7); 2000, CCAMLR (58.6, 58.7); 2003, CCAMLR (48.3)	1998, CCAMLR (58.5.1); 2001, CCAMLR (48.3); 1990, NZ	1989-1992, NZ; Australia; Chile; Argentina; Indian Ocean; 1996-1998, CCAMLR (58.7)	Robertson *et al*. 2003a; CCAMLR 1996-2003; Bartle 1991; Murray *et al*.1993; Nel and Nel 1999
12	*Thalassarche salvini (Diomedea salvini)*	Salvin's albatross		NZ	NZ	Robertson *et al*. 2003a, 2004
13	*Thalassarche eremita (Diomedea eremita)*	Chatham albatross		NZ	NZ; Chile; Peru	Robertson *et al*. 2003a

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
14	*Thalassarche impavida (Diomedea impavida)*	Campbell albatross		NZ	NZ	Murray *et al*.1993; Bartle 1990; Robertson *et al*. 2003a, 2004
15	*Thalassarche melanophyrys (Diomedea melanophyrys)*	Black-browed albatross	2001, 2002 Chile; CCAMLR (48, 58, 88); 1996, CCAMLR; 1997, 1998, CCAMLR (48.3, 58.7); 1999, 2000, CCAMLR (48.3); 2001, CCAMLR (48.3, 58.6, 58.7); 2003 CCAMLR (48.3, 58.5.2)	Patagonian waters; NZ; CCAMLR (48, 88); 1999, 2000, 2001, 2002, CCAMLR (48.3); 2003 CCAMLR (48.3, 58.5.2)	NZ; 1995 Brazil; 1993-4, Uruguay; Australia; Chile; Argentina; S.Africa; Namibia	Arata and Moreno 2002; Robertson *et al*. 2003a, 2004; CCAMLR 1996- 2003; Schiavini *et al*. 1998; Murray *et al*.1993; Neves and Olmos 1998; Stagi *et al*. 1998; Gandini *et al*. 1999
16	*Thalassarche steadi*	White-capped albatross		NZ	NZ; Australia; S. Africa; Namibia	Bartle 1991; Murray *et al*.1993; Robertson *et al*. 2003a, 2004
	Procellariidae	Petrels and shearwaters				
	Daption capense	Cape petrel	2001, Chile; 1999-2002, CCAMLR (48.3); 2003, CCAMLR (48.3, 58.5.2)	1999, 2003, CCAMLR (58.5.2); NZ	NZ	Arata and Moreno 2002; CCAMLR 1999-2003; Murray *et al*.1993; Robertson *et al*. 2004
	Fulmarus glacialoides	Southern fulmar	1998, CCAMLR (48.3)			CCAMLR 1998
	Halobaena caerulea	Blue petrel				

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
17	*Macronectes giganteus*	Southern giant petrel	1996, CCAMLR; 1997, CCAMLR (48.3, 58.7); 1998, CCAMLR (48.3, 58.6, 58.7); 1999, 2000, CCAMLR (48.3, 58.6, 58.7); 2001, 2002, CCAMLR (48.3)	2003, CCAMLR (58.5.2)	NZ; 1996-1998, CCAMLR (58.7)	CCAMLR 1996- 2002; Murray *et al*.1993; Nel and Nel 1999; Robertson *et al*. 2004
18	*Macronectes halli*	Northern giant petrel	1996, CCAMLR; 1997, CCAMLR (48.3, 58.7); 1998, CCAMLR (58.6, 58.7); 2000, CCAMLR (48.3, 58.6, 58.7) ; 2002, CCAMLR (48.3)	NZ	NZ; Australia; Chile; Argentina; 1997-1998, CCAMLR (58.7)	CCAMLR 1996-2002; Robertson *et al*. 2003a, 2004; Nel and Nel 1999
	Pachyptila crassirostris	Southern fulmar prion				
	Pachyptila desolata	Antarctic prion		2000, CCAMLR (58.5.2); 2002, CCAMLR (48.3); NZ		CCAMLR 2000, 2002; Robertson *et al*. 2004
	Pachyptila turtur	Southern fairy prion		NZ		Robertson *et al*. 2004
	Pagodroma nivea	Snow petrel				

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
19	*Procellaria aequinoctialis*	White-chinned petrel	2001 Chile; 1996, CCAMLR; 1997, 1998, CCAMLR (48.3, 58.7); 1999, CCAMLR (48.3, 58.6, 58.7); 1998, 2000, 2001, CCAMLR (58.6, 58.7); 2002 CCAMLR (48.3); 2003, CCAMLR (48.3, 58.5.2, 58.6, 58.7, 51)	Patagonian waters; NZ; 1999, CCAMLR (48.3, 58.5.2); 2001, 2002, CCAMLR (48.3); 2000, 2003, CCAMLR (58.5.2)	1995 Brazil; NZ; Australia; Argentina; S. Africa; 1996-1997, CCAMLR (58.7)	Arata and Moreno 2002; CCAMLR 1996- 2003; Schiavini *et al*. 1998; Bartle 1991; Neves and Olmos 1998; Robertson et al. 2003a, 2004; Nel and Nel 1999
20	*Procellaria cinerea*	Grey petrel	1997, 1998, CCAMLR (58.7); 1999-2003, CCAMLR (58.6, 58.7, 51)	NZ	NZ; Australia; S. Africa; Namibia	CCAMLR 1997-2003; Robertson *et al*. 2003a, 2004; Murray *et al*.1993; Bartle 1990
	Procellaria conspicillata	Spectacled petrel			1995 Brazil	Neves and Olmos 1998
	Procellaria westlanica	Westland petrel		NZ	NZ; Australia	Murray *et al*.1993; Robertson *et al*. 2003a, 2004
	Pterodroma inexpectata	Mottled petrel			North Pacific	Robertson *et al*. 2003a
	Pterodroma lessonii	White-headed petrel				
	Pterodroma macroptera	Great-winged petrel		2001, CCAMLR (48.3); NZ	NZ; Australia	CCAMLR 2001; Robertson *et al*. 2003a, 2004
	Pterodroma magentae	Chatham Island taiko				

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
	Pterodroma mollis	Soft-plumaged petrel				
	Puffinus assimilis	Subantarctic little shearwater				
	Puffinus bulleri	Buller's Shearwater		North Pacific	NZ	Robertson *et al*. 2003a, 2004
	Puffinus carneipes	Flesh-footed shearwater		NZ	NZ; Australia; North Pacific	Robertson *et al*. 2003a, 2004
	Puffinus creatopus	Pink-footed shearwater				
	Puffinus gavia	Fluttering shearwater			NZ	Robertson *et al*. 1998
	Puffinus gravis	Great shearwater			1995 Brazil	Neves and Olmos 1998
	Puffinus griseus	Sooty shearwater	2001 off Chile;	NZ	NZ; Australia; N. Pacific; Argentina	Arata and Moreno 2002; Robertson *et al*. 2003a, 2004; Bartle 1991; Gandini *et al*. 1999
	Puffinus huttoni	Hutton's shearwater			NZ	Robertson *et al*. 2003a
	Puffinus tenuirostris	Short-tailed shearwater		NZ		Robertson *et al*. 2004
	Thalassoica Antarctica	Antarctic petrel				
	Pelecanoididae	Diving petrels				
	Pelecanoides urinatrix	Subantarctic diving petrel		2000, CCAMLR (58.5.2); NZ	NZ	CCAMLR 2000; Robertson *et al*. 2004
	Hydrobatidae	Storm petrels				
	Fregatta tropica	Black-bellied storm petrel				
	Oceanites nereis	Grey-backed storm petrel				
	Oceanites oceanicus	Wilson's storm petrel	1999, CCAMLR (48.3)			CCAMLR 1999
	Charadriiformes					

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
	Chionidae	Sheathbills				
	Chionis alba	Snowy (American) sheathbill				
	Chionis minor	Lesser sheathbill (Black-faced sheathbill)				
	Laridae	Gulls, terns, skuas and jaegers				
	Catharacta chilensis	Chilean skua				
	Catharacta antarctica Lönnbergi	Antarctic skua			1997-1998, CCAMLR (58.7)	Nel and Nel 1999
	Catharacta maccormicki	South polar skua				
	Catharacta skua	Great skua				
	Larus dominicanus	Southern black-backed gull, Kelp gull				
	Sterna vittata	Antarctic tern	1996, CCAMLR			CCAMLR 1996
	Sterna virgula	Kerguelen tern				
	Sphenisciformes					
	Spheniscidae	Penguins				
	Aptenodytes forsteri	Emperor penguin				
	Aptenodytes patagonicus	King Penguin				
	Eudyptes chrysolophus	Macaroni penguin			1997-1998, CCAMLR (58.7)	Nel and Nel 1999
	Eudyptes chysocome	Rockhopper penguin				
	Pygoscelis adeliae	Adélie penguin		2003, CCAMLR (58.5.2)		CCAMLR 2003
	Pygoscelis Antarctica	Chinstrap penguin				
	Pygoscelis papua	Gentoo penguin	1999, CCAMLR (48.3, 58.6, 58.7)			CCAMLR 1999
	Pelecaniformes					
	Phalacrocoracidae					

#	Species Name	English Name	Caught in Toothfish Longline	Caught in Trawl	Other Interactions with Fisheries	References
	Phalacrocorax atriceps verrucosus	Kerguelen (Imperial) cormorant			Argentina	Gandini *et al*. 1999
	Phalacrocorax bransfieldensis	Antarctic shag				
	Phalacrocorax melanogenis	Crozet shag				

Table 22 (Sec. 3.4.b.): Bycatch numbers and rates (birds/thousand hooks) in longline fisheries in CCAMLR subareas 48.3, 58.6, and 58.7, from SC-CCAMLR-XXIII, Annex 5, Table 7.3.

Subarea	Year							
	1997	1998	1999	2000	2001	2002	2003	2004
48.3								
Estimated bycatch	5,755	640	210*	21	30	27	8	18
Bycatch rate	0.23	0.032	0.013*	0.002	0.002	0.0015	0.0003	0.001
58.6, 58.7								
Estimated bycatch	834	528	156	516	199	0	7	39
Bycatch rate	0.52	0.194	0.034	0.046	0.018	0	0.0003	0.025
88.1, 88.2								
Estimated bycatch	-	0	0	0	0	0	0	1
By-catch Rate	-	0	0	0	0	0	0	0.0001

*Does not include bycatch from the *Argos Helena* line-weighting experiment

Table 23 (Sec. 3.4.b.): Bycatch numbers (birds) in trawl fisheries in the CCAMLR subareas 48.3 and 58.5.2; data from SC-CCAMLR-XXIII, Annex 5, Table 7.18. Bycatch rates are not available for this fishery.

Year	Areas	Number of Vessels	Caught Dead	Caught Alive
1999	48.3	1	6	1
2000	48.3	2	19	5
2001	48.3	3	92	40
2002	48.3	5	68	52
	58.5.2	1	0	1
2003	48.3	3	36	15
	58.5.2	4	6	11
2004	48.3	6	87	132
	58.5.2	2	0	7

Indirect and cumulative impacts associated with fishing

Indirect effects through changes in prey availability:

Seabird species differ greatly from one another in their prey requirements and feeding behaviors, leading to substantial differences in their responses to changes in the environment. Diets consist largely of fish or squid less than 15 cm long and large zooplankton. Although they may take a wide variety of prey species during the year, most seabirds in a given area and time depend on one or a few prey species (Springer 1991). Diets and foraging ranges are most restricted during the breeding season, when high-energy food must be delivered efficiently to nestlings, and are somewhat more flexible at other times of the year.

A major constraint on seabird breeding is the distance between the breeding grounds on land and the feeding zones at sea (Weimerskirch and Cherel 1998). Breeding success in most species varies among years, but in stable populations, poor success is compensated for by occasional good years (Boersma 1998, Russell *et al*. 1999). Adult non-breeding seabird survival is unlikely to be affected by the common interannual variability of prey stock because adults can shift to alternative prey or migrate to seek prey in other regions. In contrast, breeding birds are tied to their colonies and local fluctuations in fish availability can have a dramatic effect on seabird reproduction. If food supplies are reduced below the amount needed to generate and incubate eggs, or if the specific species and size of prey needed to feed chicks are unavailable, local reproduction by seabirds will fail (Hunt *et al*. 1996). The natural factor most often associated with lower breeding success is food scarcity (Kuletz 1983, Murphy *et al*. 1984, Murphy *et al*. 1987, Springer 1991, Furness and Monaghan 1987). Reproductive success, therefore, is usually limited by food availability (Furness 1982). Outside the breeding season, diets, feeding habitats, energy requirements, and distribution have been studied only minimally for most seabird species.

The availability of prey to seabirds depends on a large number of factors and differs among species and seasons. All seabird species depend on one or more oceanographic processes that concentrate their prey at the necessary time and place; these include upwellings, stratification, ice edges, fronts, gyres, and tidal currents (Schneider *et al*. 1987, Coyle *et al*. 1992, Elphick and Hunt 1993, Hunt and Harrison 1990, Hunt 1997, Hunt *et al*. 1999, Springer *et al*. 1999). Oceanographic phenomena that influence seabird foraging habitat primarily are on the scale of hundreds of meters to hundreds of kilometers (Hunt and Schneider 1987). Favorable foraging conditions are likely to last for a relatively short time (hours to weeks) at one spot and for many seabirds foraging in shelf waters, small-scale physical processes that concentrate prey are very important for successful foraging (Hunt *et al*. 1999). Prey availability may also depend on the ecology of food species, including productivity, other predators, food-web relationships of the prey, and prey behavior, such as migration of fish and zooplankton. Many factors that influence prey availability are completely unknown. Most critical is the lack of information on how events beyond a seabird's foraging range may influence the prey availability. Such factors may include environmental changes, fluctuations in region wide stocks of forage and non-forage species, and commercial harvests.

Reductions in the availability of forage fish to seabirds have been attributed to both climatic cycles and commercial fisheries but an NRC study (1996) concluded that both factors probably are significant. Regime shifts are major changes in atmospheric conditions and ocean climate that take place on multi-decade time scales and trigger community-level reorganizations of the marine biota (Anderson and Piatt 1999). In nations with directed forage fish fisheries, some stocks have been decimated due to a combination of climatic and fishery pressures, which led to local population declines in seabirds (Duffy 1983, Anker-Nilssen and Barrett 1991, Crawford and Shelton 1978).

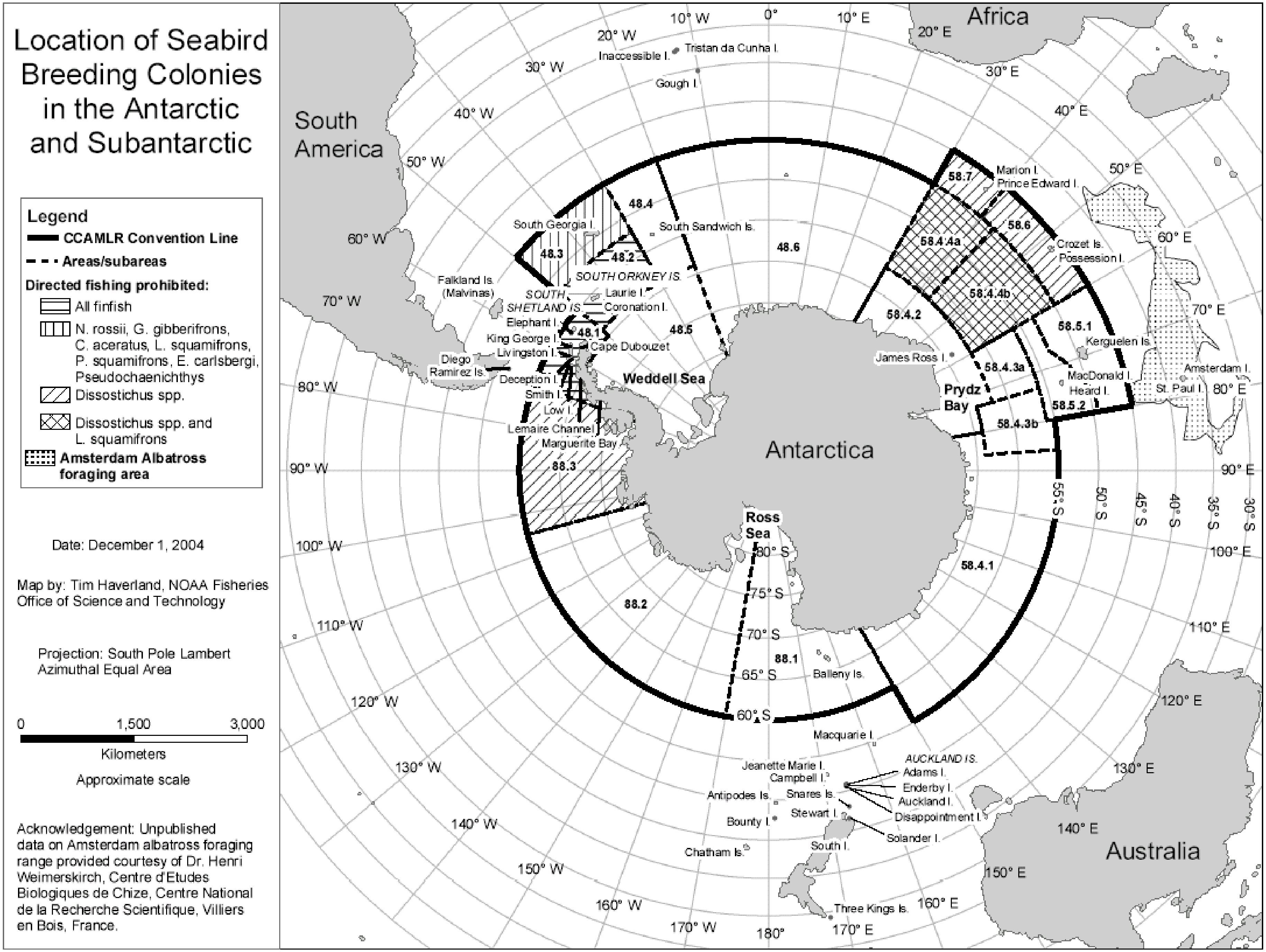
Competition and predation may also influence seabird prey availability. Links between seabirds and other species could be direct or they could be extremely diffuse and indirect. Possible links include competition among seabird species (Mehlum *et al*. 1998, Hunt *et al*. 1999b); competition of piscivorous seabirds with other large marine predators such as marine mammals and fish (Harrison 1979, Hunt 1990, Obst and Hunt 1990); and competition for food among forage species. Little information is available on the magnitude or direction of these potential links.

Seabirds may have impacts on fish stocks within foraging range of seabird colonies, however, because the birds are concentrated there during summer (Springer *et al*. 1986, Roseneau *et al*. 1998, Birt *et al*. 1987). About 15 to 80 percent of the biomass of juvenile forage fish may be removed by birds near breeding colonies each year (Wiens and Scott 1975, Furness 1978, Springer *et al*. 1986, Logerwell and Hargreaves 1997). This suggests that food availability to birds may be limited, at least in a given season, by the size of the local component of fish stocks. Seabirds may, therefore, be vulnerable to factors that reduce forage fish stocks in the vicinity of colonies (Monaghan *et al*. 1994).

As mentioned earlier, the African penguin (*Spheniscus demersus*) has been subject to population declines due to lack of prey caused by fishery pressure (Crawford in press and in WG-EMM-04/28). In some cases fishing can depress prey to the point of affecting seabird populations, though this has not frequently been documented as most research has addressed the direct impacts of fishing. Some sources have attributed the increase of some penguin species recently to the greater availability of krill following the reduction of some Antarctic whale populations (Marchant and Higgins 1990). However, others have argued that the penguin populations (i.e., Adélie and Chinstrip penguins) respond more to sea ice conditions than to krill abundance (Fraser *et al*. 1992 and refs. therein).

<u>Indirect effects by introducing mammalian predators to nesting islands</u>:

Seabirds are extremely sensitive to the introduction of mammalian predators. Non-native mammals have been introduced to islands through several pathways. Some are introduced intentionally as agriculture and companion animals. Others arrive accidentally, such as rats on fishing and other vessels at dock or after a wreck (Brechbill 1977; Jones and Byrd 1979; Bailey 1993). Alien mammals introduced on islands (brown rats, cats, dogs, pigs, cattle) have played a major role in depleting the local seabird populations or driving them to extinction (Jones and Byrd 1979; Moors *et al*. 1992; Burger and Gochfeld). Mitigation measures are being undertaken and eradication programs exist on several seabird breeding islands (see Jouventin 1994 and Gales 1993).


Location of Seabird
Breeding Colonies
in the Antarctic
and Subantarctic
Legend
CCAMLR Convention Line
Areas/subareas
Directed fishing prohibited:
All finfish
N. rossii, G. gibberifrons, C. aceratus, L. squamifrons, P. squamifrons, E. carlsbergi, Pseudochaenichthys
Dissostichus spp.
Dissostichus spp. and L. squamifrons
Amsterdam Albatross foraging area
Date: December 1, 2004
Map by: Tim Haverland, NOAA Fisheries Office of Science and Technology
Projection: South Pole Lambert Azimuthal Equal Area
0
1,500
3,000
Kilometers
Approximate scale
Acknowledgement: Unpublished data on Amsterdam albatross foraging range provided courtesy of Dr. Henri Weimerskirch, Centre d'Etudes Biologiques de Chize, Centre National de la Recherche Scientifique, Villiers en Bois, France.
South America
Africa
Australia
Antarctica
Weddell Sea
Ross Sea
Prydz Bay
Falkland Is. (Malvinas)
Diego Ramirez Is.
South Georgia I.
South Sandwich Is.
SOUTH ORKNEY IS.
Laurie I.
Coronation I.
SOUTH SHETLAND IS.
Elephant I.
King George I.
Livingston I.
Cape Dubouzet
Deception I.
Smith I.
Low I.
Lemaire Channel
Marguerite Bay
Inaccessible I.
Tristan da Cunha I.
Gough I.
Marion I.
Prince Edward I.
Crozet Is.
Possession I.
Kerguelen Is.
MacDonald I.
Heard I.
Amsterdam I.
St. Paul I.
James Ross I.
Balleny Is.
Macquarie I.
Jeanette Marie I.
Campbell I.
Antipodes Is.
Snares Is.
Bounty I.
Stewart I.
Chatham Is.
South I.
Three Kings Is.
AUCKLAND IS.
Adams I.
Enderby I.
Auckland I.
Disappointment I.
Solander I.
48.1
48.2
48.3
48.4
48.5
48.6
58.4.1
58.4.2
58.4.3a
58.4.3b
58.4.4a
58.4.4b
58.5.1
58.5.2
58.6
58.7
88.1
88.2
88.3
0°
10° W
20° W
30° W
40° W
50° W
60° W
70° W
80° W
90° W
100° W
110° W
120° W
130° W
140° W
150° W
160° W
170° W
180°
10° E
20° E
30° E
40° E
50° E
60° E
70° E
80° E
90° E
100° E
110° E
120° E
130° E
140° E
150° E
160° E
170° E
30° S
35° S
40° S
45° S
50° S
55° S
60° S
65° S
70° S
75° S
80° S

Regulated Fisheries Outside the CCAMLR Area

To address problems of bycatch of Convention Area seabirds in areas adjacent to the Convention Area - historically (since the 1970s) the most important cause of many of the population declines of albatrosses and petrels in the Convention Area – CCAMLR has requested closer collaboration with Members and regional fishery management organizations with jurisdiction and responsibility for longline fisheries in these areas. In particular, CCAMLR is advocating that the use of appropriate measures to minimize seabird bycatch be made obligatory for all longline fishing vessels and that appropriate assistance be given to facilitate this.

IUU Fishing

Illegal, unregulated and/or unreported harvest of toothfish within the Convention Area is estimated annually. Illegal fishing is not reported or suspected in any of the other Convention Area fisheries. For 2002/03 and 2003/04 the reported CCAMLR regulated catch of toothfish was 16,807 mt and 13,307 mt, respectively. The WG-FSA estimated the IUU catch within the Convention Area as 10,070 mt and 2,622 mt for 2002/03 and 2003/04, respectively. Taken together, the estimated catch of toothfish, legal and IUU, within the Convention Area was 26,877 mt and 15,929 mt for 2002/03 and 2003/04, respectively. WG-FSA and WG-IMAF estimated the seabird mortality associated with the estimated IUU catch of toothfish in 2002/03 to be 17,585 seabirds (95% confidence interval range of 14,412 to 46,954), and in 2003/04 to be 5,311 seabirds (95% confidence interval range of 4,352 to 14,166). The decrease in estimated IUU bycatch between 2003 and 2004 reflects reduced toothfish removals or changes to where IUU occurs. The Commission endorsed the advice of its Scientific Committee that such levels of mortality continue to be unsustainable for the populations of albatrosses and giant and white-chinned petrels breeding in the Convention Area.

In addition, there is a reported catch of toothfish from within the EEZs and on the high seas north of the Convention Area in FAO Statistical Area 87 (the west coast of South America), FAO Statistical Area 81 (west of Area 87), and FAO Statistical Area 41 (the east coast of South America) totaling 18,919 mt. See the attached chart of the FAO Statistical Areas (Attachment 5). Thus, globally, for the 2002/03 fishing season, the toothfish catch was 44,920 mt.

It is highly unlikely that vessels engaged in IUU fishing are deploying streamer lines or other effective seabird avoidance gear and methods. Even the minimal additional effort and cost of some mitigation measures (e.g., streamer lines) are unlikely to be borne by vessels fishing illegally. In addition, seabird avoidance techniques are shared among fishermen and representatives of their countries through the CCAMLR forum, which IUU fishermen have by definition elected not to participate in.

CCAMLR has adopted a list of illegal, unregulated and unreported fishing vessels (the IUU vessel list) for vessels suspected of IUU fishing or trading in toothfish and placed the list on a password protected section on the CCAMLR website. All Members of CCAMLR were urged to prohibit any trade from these IUU vessels. The United States is considering ways to implement this measure through possible future rulemaking. Eight vessels are currently on the list: three Contracting Party vessels and five non-Contracting Party vessels.

Bycatch of seabirds in IUU longline fishing in the Convention Area remains a serious problem. CCAMLR concluded that current levels of mortality remain entirely unsustainable for populations of albatrosses, giant petrels and white-chinned petrels breeding in the Convention Area, many of which are declining at rates where extinction is possible. This situation is viewed by CCAMLR with the greatest concern, and CCAMLR has adopted strict measures have been implemented to address the problem of unregulated fishing, with additional measures under development.

Marine Debris and Discharges

CCAMLR Members have conducted marine debris surveys in the Convention Area for over a decade. There have been no reported incidences of ESA-listed Amsterdam albatross interaction with the surveyed debris. Other seabird species are reported as interacting with marine debris (e.g., wandering albatross). The UK annually reports to CCAMLR on the occurrence of fishing gear, marine debris, and oil associated with seabirds at Bird Island, South Georgia (in SubArea 48.3). The level of marine debris found in seabird colonies at Bird Island has increased particularly since 1998, with fishing gear such as lines and hooks forming the major part of the debris (SC-CAMLR, 2003). Continued evidence of the discarding of longline hooks in offal and bycatch is of concern. Based on items found in regurgitates, an estimated 630 longline hooks and/or snoods were ingested by wandering albatross chicks at South Georgia in 2003 (Phalan, 2003).

CCAMLR has adopted a conservation measure regulating the use and disposal of plastic packaging bands on fishing vessels. The measure prohibits the use on fishing vessels of plastic packaging bands to secure bait boxes. It also prohibits the use of other plastic packaging bands for other purposes on fishing vessels that do not use onboard incinerators (closed systems). Any packaging bands, once removed from packages, must be cut, so that they do not form a continuous loop and must at the earliest opportunity burned in the onboard incinerator. Any plastic residue must be stored on board the vessel until reaching port, and in no case be discarded at sea. CCAMLR placards and brochures on handling, storing, and discarding refuse must be displayed on the vessel and available to the crew.

All vessels participating in the exploratory longline fishery for toothfish in Subarea 88.1 are prohibited from discharging: (i) oil or fuel products or oily residues into the sea, except as permitted in Annex I of MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978); (ii) garbage; (iii) food wastes not capable of passing through a screen with openings no greater than 25 mm; (iv) poultry or parts (including egg shells); (v) sewage within 12 nautical miles of land or ice shelves, or sewage while the ship is traveling at a speed of less than 4 knots. In addition, no live poultry or other living birds may be brought into Subarea 88.1 and dressed poultry not consumed must be nautical miles of the coast of the Balleny Islands, an area being considered for protected status.

Potential Oil Spills

At its 2003 annual meeting, CCAMLR discussed safety concerns regarding fishing vessels operating in high latitudes. It also agreed that a definition of suitable specifications for vessels would enhance the health and safety of crew and scientific observers at sea, and would reduce the risk of accidents and pollution in high latitudes. Accordingly, CCAMLR adopted a resolution on ice-strengthening standards for fishing vessels operating in high latitude fisheries in the Convention Area. Members were urged by the resolution to license only those of their flag vessels with a minimum ice classification standard of ICE-1C to fish in the Convention Area. NMFS intends to require U.S. vessels fishing in the Convention Area to meet these standards through implementation of regulations in the future patterned after Decision 4 (2004): Guidelines for ships operating in Arctic and Antarctic ice-covered Waters, ATCM XXVII, Cape Town, South Africa.

Tourism

Tourism in the Convention area is conducted in Subarea 48, the Antarctic Peninsula region. The geographic scope of tourism activities in this region can be divided roughly into several sub areas: (1) South Orkneys including Laurie, Coronation Islands; (2) Elephant Island including nearby islands; (3) South Shetland Islands including Deception, Livingston, King George, Low and Smith Islands; (4) Northeast Antarctic Peninsula From Cape Dubouzet (63º 16' S, 57º 03' W) to James Ross Island; (5) Northwest Antarctic Peninsula From Cape Dubouzet (63º 16' S, 57º 03' W) to the north end of Lemaire Channel; and (6) Southwest Antarctic Peninsula From the north end of Lemaire Channel to the area of Marguerite Bay (67º 34' S). Antarctic visits are mainly concentrated at ice-free coastal zones over the five-month period from November to March. Ship strikes or other harmful interactions by tourist vessels with whales have not been reported.

Tourist expeditions have ventured to Antarctica every year since 1966. Tourism in the Antarctic is predominately by some 20 vessels carrying 45 to 280 passengers each. The ships are ice strengthened and sail primarily to the Antarctic Peninsula region. Some itineraries also include South Georgia and the Falkland Islands (Islas Malvinas). These voyages generally depart from Ushuaia (Argentina), Port Stanley (Falkland Islands) or to a lesser extent from Punta Arenas (Chile), Buenos Aires (Argentina) or Puerto Madryn (Argentina).

Sporadic voyages to Antarctica have also included larger passenger vessels (up to 960 tourists), some of which conduct sightseeing cruises only without landings. Yacht travel to Antarctica is also popular, with nearly all itineraries in the Antarctic Peninsula, and using Ushuaia, Argentina as a port.

SECTION 4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES CONSIDERED

This section will analyze and compare impacts of alternatives together under each issue by ecological (including biological), economic and social impacts, if any.

4.1 ISSUE ONE: Controls on Harvesting

I. ACTION: Impose harvest limits on amounts of AMLR that may be caught by U.S. vessels in **"assessed (established) fisheries"** (fisheries about which sufficient fisheries dependent and fisheries independent data are available to estimate a preliminary level of biomass): **"exploratory fisheries"** (fisheries about which little or no data exist upon which to estimate a preliminary level of biomass and for which a Research and Fisheries Operation Plan has been submitted and approved by the CCAMLR Scientific Committee); and **"future exploratory fisheries"** (fisheries about which little or no data exist upon which to estimate a preliminary level of biomass and for which a Research and Fisheries Operation Plan must be submitted to the CCAMLR Scientific Committee for review and approval before a fishery can take place).

It is important to stress that these various alternatives, whether dealing with assessed (established) fisheries or exploratory fisheries, will only affect the *potential* harvest that may be taken by U.S. vessels. They will have no direct effect on the harvest of vessels from other nations, and due to the relatively small historical U.S. harvests, it is unlikely that they will even have indirect effects on other vessels. U.S. vessels have had limited participation in Convention Area fisheries with seven vessels since 1991 having held permits to fish in the crab, krill or toothfish fisheries. For the most part then, given existing market and harvesting conditions, none of the alternatives is likely to have significant effects on the fish stocks. Likewise, although there are large potential differences between some alternatives, given existing circumstances the actual effect on U.S. harvests and industry profits of the first three alternatives will be minimal. See Table 24 for past U.S. and international harvests as well as harvest levels under the proposed alternatives examined in Sec. 4. In addtion, Sec. 3.2 Fishery Participants, Gear Types, and Affected Area contains additional information on U.S. harvesting and harvesters.

Table 24 (Sec. 4.1): Maximum catches during any one year during the last decade by the United States and all countries combined, current catch limit, and alternative harvest levels of catch under four proposed alternatives (see text).

	U.S. Highest Annual Harvest in the Past 10 Years	Highest Annual Harvest By All Countries in Past 10 Years	Alternative 1: Current Catch Limit	Alternative 2: Twice Highest by All Countries	Alternative 3: One-half Highest by All Countries	Alternative 4: No Harvest
TOOTHFISH						
48.3	178	7,528	4,420	15,056	3,764	0
48.4	0	0	28	0	0	0
48.6	0	0	455	0	0	0
58.4.1	0	0	800	0	0	0
58.4.2	0	117	500	234	59	0
58.4.3a	0	0	250	0	0	0
58.4.3b	0	0	300	0	0	0
58.5.2.	0	3,765	2,873	7,530	1,883	0
88.1	0	1,831	3,250	3,662	916	0
88.2	0	375	106	750	188	0
ICEFISH						
48.3	0	4,114	2,887	8,228	2,057	0
58.5.2	0	2,366	292	4,732	1,183	0
KRILL						
48.1	2,816	71,997	1,008K	143,994	35,999	0
48.2	7,062	72,060	1,104K	144,120	36,030	0
48.3	4,784	66,151	1,056K	132,302	33,076	0
48.4	0	0	832K	0	0	0
54.4.1	0	1,266	440K	2,532	633	0
54.4.2	0	0	450K	0	0	0
SQUID						
48.3	0	81	2,500	162	41	0
CRAB						
48.3	283	283	1,600	566	142	0
MACROURUS						
58.4.3a	0	0	26	0	0	0
58.4.3b	0	0	159	0	0	0
FOUR SPECIES[a]						
58.4.2	0	0	2,000	0	0	0

[a] Spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*).

ASSESSED FISHERIES:

A. Toothfish harvesting in Subarea 48.3.

Alternative A1:	Issue permits annually in Subarea 48.3 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**
Alternative A2:	Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Subarea 48.3 by season limiting harvest to 15,056 mt (twice the largest amount of annual international harvest during the period from 1993-2003).
Alternative A3:	Issue permits annually in Subarea 48.3 by season and by limiting harvest to 3,764 mt (half the largest amount of annual international harvest during the period from 1993-2003).
Alternative A4:	United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

Historically, U.S. boats have only operated in Subarea 48.3, but the two vessels that did that fishing were also permitted to fish in Subarea 88.1 for the 2003/2004 season. While they did catch a small amount of toothfish there, the vessels were sold before the season was completed.

The range of potential harvest available to U.S. boats that is analyzed under the four alternatives in Subarea 48.3 is from zero to 15,056 mt although the latter would not be possible unless the TAC were increased. Assuming the TAC stays in the current range, the highest possible U.S. catch would be 4,420 mt. But Alternatives 1, 2, or 3 are operationally the same. The highest U.S. catch in the last ten years was 178 mt (Table 24). Whether the potential amount U.S. boats are allowed to catch is 3,764 mt, 4,420 mt, or 15,056 mt will make no difference. Even the smallest is 21 times more than has ever been harvested there. Such an increase in harvest is very unlikely because of the strong competition from other countries. In this area the highest annual total catch in the last ten years is greater than the current TAC, indicating that there is potentially very strong competition here. Even a change in market conditions or harvest technology will not result in an increase in U.S. harvest because these changes will affect all countries in the same way and so relative catch shares will not change.

In summary, given the low historical U.S. catch, the strong competition for harvest share, and the fact that the two vessels that fished this Subarea made the choice to move, it is likely that there will be no effect on U.S. fisheries for toothfish in Subarea 48.3 from adopting Alternatives 1, 2, or 3. In any case, even if the boats decided to return to the area, it is hard to imagine that they would take more than their ten-year high. If no boats return to this area, then even Alternative 4 would have no effect. However, Alternative 4 would prevent the possibility of the boats returning that would cut down their choice of area, but would not preclude them from fishing toothfish. However, this could impose significant economic constraints on any U.S. boats wishing to fish in this area but, because of the other options for fishing toothfish, and the almost infinitesimal role played by toothfish in U.S. total harvest, it would have no real effect on the U.S. fishing industry as a whole.

Since the consumption of toothfish in the United States is supported by an international import market, and since none of the alternatives will affect what vessels from other countries will be able to take, they will have no effect on U.S. imports (consumption).

The range of potential harvest available to U.S. boats under the four alternatives in Subarea 48.3 is from zero to 15,056 mt although the latter would not be possible unless the catch limit was increased. This would be done only if new biological information determined from fishery independent survey(s) indicated that stock biomass had increased.

Assuming the catch limit remains unchanged, the highest possible U.S. catch would be 4,420 mt. Because the catch limit was determined using the GYM that is precautionary, harvesting at any level (Alternatives 1 or 3) up to the catch limit would be sustainable and not adversely affect the stocks. At present harvesting at Alternative 2 levels would not be permitted, however, if in the future the catch limits are increased by CCAMLR even to the level specified in Alternative 2, given the required procedures to approve such an increase, harvesting at that level would not adversely affect stock levels.

Because toothfish stocks in Subarea 48.3 are predominately found around South Georgia Island, including Shag Rocks, most fishing occurs in those areas. Stock distribution, spawning success, or short-term biological productivity should not be affected as long as harvest levels remain at or less than the catch limit.

If catch limits set out in Alternatives 1, 2, and 3 were determined by CCAMLR based on the precautionary GYM approach, then there would be minimal ecological and biological impacts. Selection of Alternative 4 would prevent the U.S. fisheries from operating in Subarea 48.3. However, the catch limit presently is being taken by non-U.S. vessels so the effect on the toothfish stocks would be the same under Alternative 4 as under the other three alternatives.

Although Subarea 48.3 is the area of highest fishing activity for toothfish, a preferred food source for killer whales and sperm whales (see Section 3.4.a. - Cetaceans), none of the alternatives are anticipated to have significant adverse affects on cetacean populations. In Subarea 48.3 during 2002 fishing operations, sperm whales were observed during 24% of hauling operations and killer whales, the second most abundant cetacean species, were observed during 5% of hauls. In the 2001/02 fishing season, the catch limit for toothfish in Subarea 48.3 was 5,820 mt and 5,744 mt were actually taken. During this season, there were reports of 5 interactions with killer whales and 4 interactions with sperm whales. These interactions include reports of whale presence and removal of fish from longlines. There have been no reports of entanglement or mortality in this Subarea, though there have been a couple of entanglements in other areas and the mention of possible mortality.

Based on the reported interactions for the 2001/02 season and the catch for that year (5,744 mt), there is likely to to be about the same number of killer and sperm whale interactions with a catch of 4,420 mt (Alternative 1) or a catch of 3,764 mt (Alternative 3) even if the rate of interactions were to increase slightly. Under Alternative 2, the number of killer and sperm whale interactions could be expected to increase by 2-3 times. In Subarea 48.3, interactions between the toothfish fishery and cetaceans appear to have more impact on the fishery than on cetaceans, though more information on cetacean abundance and consumption rates of toothfish would be required to accurately assess fishery impacts.

Consequences of alternatives associated with controls on Toothfish Subarea 48.3 on seabirds are limited. As discussed above, the maximum catch that the United States could permit is the CCAMLR catch limit. Regardless of the U.S. vessel catch, other countries are likely to harvest the remainder of the CCAMLR limit. The estimated total seabird bycatch in this area in 2003 was 8 birds at a rate of 0.0003 birds/thousand hooks set (CCAMLR 2003). None of the birds caught were Amsterdam albatrosses, and no species caught would likely be affected by the loss of birds at the current rate, even if CCAMLR catch limits were doubled. No reduction in bycatch could be expected if the United States objected to CCAMLR catch limits.

Based upon ecological and socioeconomic information, **Alternative A1 is the preferred alternative** as it ensures that the total amount of harvest, U.S. and non-U.S., be at or below the CCAMLR established catch limit which is precautionary to ensure effects on the toothfish stocks in Subarea 48.3 are not adverse.

B. Toothfish harvesting in Divison 58.5.2.

Alternative B1: Issue permits annually in Division 58.5.2 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative B2:	Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Division 58.5.2 by season limiting harvest to 7,530 mt (twice the largest amount of annual international harvest during the period from 1993-2003).
Alternative B3:	Issue permits annually in Division 58.5.2 by season and by limiting harvest to 1,883 mt (half the largest amount of annual international harvest during the period from 1993-2003).
Alternative B4:	United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

The analysis of the effects of the various alternatives on fishing for toothfish in Division 58.5.2 is essentially identical to that for Subarea 48.3. The range of potential harvest available to U.S. boats under the four alternatives in Division 58.5.2 is from 0 to 7,530 mt although the latter would not be possible unless the catch limit was increased. This would be done only if new biological information determined from fishery independent survey(s) indicated that stock biomass had increased.

Assuming the catch limit remains unchanged, the highest possible U.S. catch would be 2,873 mt. At present harvesting at Alternative 2 levels would not be permitted. If in the future the catch limits, which are determined using the precautionary GYM, are increased by CCAMLR even to the level specified in Alternative 2, harvesting at that level would not adversely affect stock levels. This is because precautionary GYM catch limits are determined using decision rules that conform to three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

The United States has never fished in Division 58.5.2. Given the lack of U.S. participation in the fishery, Alternatives 1, 2, and 3 will not place a binding constraint on U.S. fishing. In fact, under current conditions, there is no reason to believe that Alternative 4 will affect the industry. The above two conclusions will hold even with market or technological improvements since they will affect vessels from all countries the same way and will not provide the United States any relative improvement. U.S. boats are not fishing there now, they have never fished there, and they are not likely to fish there in the future; a prohibition on fishing will not affect them.

Consequences of alternatives associated with controls on Toothfish Division 58.5.2 on cetaceans are limited. There have been no reported interactions between the toothfish fishery in CCAMLR Division 58.5.2 and cetaceans; thus, there are no anticipated adverse impacts on cetaceans from any of the alternatives.

Consequences of alternatives associated with controls on Toothfish Division 58.5.2 on seabirds are limited due to the nature of international management of the fishery. As described above, the maximum catch that the United States could permit is the CCAMLR catch limit. Regardless of the U.S. vessel catch, other countries are likely to harvest the remainder of the CCAMLR limit. No seabirds were recorded as bycatch on the U.S. longline vessel that fished in this area in 2003 or 2004, and consequently no estimate of bycatch can be provided if catch limits were to increase. No reduction in bycatch could be expected if the United States objected to CCAMLR catch limits. The only option that would allow the United States to effect bycatch would be to set maximum bycatch limits on U.S. vessels that are lower than limits set by CCAMLR. However, this is unlikely to have an impact, since no bycatch has been recorded in this Division.

Therefore, based upon ecological and socioeconomic information, **Alternative B1 is the preferred alternative** as it requires that all fishing, U.S. and non-U.S., harvest at or below the CCAMLR established catch limit which is precautionary to ensure effects on the toothfish stocks in Division 58.5.2 are not adverse.

C. Icefish harvesting in Subarea 48.3.

Alternative C1: Issue permits annually in Subarea 48.3 by season and within the CCAMLR catch limits on vessels participating in the icefish trawl fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative C2: Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Subarea 48.3 by season limiting harvest to 8,228 mt (twice the largest amount of annual international harvest during the period from 1993-2003).

Alternative C3: Issue permits annually in Subarea 48.3 by season and by limiting harvest to 2,057 mt (half the largest amount of annual international harvest during the period from 1993-2003).

Alternative C4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

The range of potential harvest available to U.S. boats under the four alternatives in Subarea 48.3 is from 0 to 8,228 mt, although the latter would not be possible unless the catch limit was increased. This would be done only if new biological information determined from fishery independent survey(s) indicated that stock biomass had increased.

Assuming the catch limit remains unchanged, the highest possible U.S. catch would be 2,887 mt. At present harvesting at Alternative 2 levels would not be permitted. If in the future the catch limits, which are determined using the precautionary GYM, are increased by CCAMLR even to the level specified in Alternative 2, harvesting at that level would not adversely affect stock levels. This is because precautionary GYM catch limits are determined using decision rules that conform to three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

The United States has never fished for icefish in Subarea 48.3. Given the lack of U.S. participation in the fishery in the past, Alternatives 1, 2, and 3 will not place a binding constraint on existing U.S. fishing. In fact, under current conditions, there is no reason to believe that Alternative 4 will affect the industry. U.S. fishers are not fishing there now and they have never fished there. A prohibition on fishing will have no affect unless U.S. fishers want to participate in the Subarea 48.3 icefish fishery in the future . Should conditions change and U.S. fisher enter the fishery, they will be competing for catch. Note that the ten year high annual harvest is greater than the current TAC, which is an indication that there is strong competition for catch. Anything U.S. fishers take will have to come out the catch of another country. There will not likely be an effect on stock size.

There are no reported interactions with the icefish fishery and cetaceans. Additionally, no reports of cetaceans consuming icefish were found. Therefore, impacts of all alternatives for icefish in Subarea 48.3 on cetaceans are unknown though presumably minimal.

In 2003, 43 birds were observed interacting with icefish trawls in Subarea 48.3, of which at least 36 were fatalities (CCAMLR 2003). The species included white-chinned petrels, black-browed albatrosses, and grey-headed albatrosses. If the United States did not participate in icefish fishing in this Subarea, bycatch would likely remain the same, as other countries would be expected to fish up to the CCAMLR catch limit. If the catch limit and fishing effort were to increase, the seabird bycatch would be expected to increase as well. Currently no highly effective mitigation measures have been developed for trawl fisheries (in contrast to longline fisheries), consequently seabird bycatch remains problematic (see Section 3). The interaction of seabirds with trawl gear has not been studied as intensively as the interaction of seabirds with longline gear, thus it is less well understood and the solutions for reducing the interactions have not been fully elucidated. Until successful mitigation measures are developed, the United States cannot affect the bycatch problem in this international fishery through domestic regulations that is more stringent than agreed upon by CCAMLR, because vessels from other countries can be expected to catch the portion of the TAC that would be made available if U.S. vessels did not fish in the Subarea. A way the United States could impact bycatch in this fishery is to permit fishers to fish, but set a lower cap than required by CCAMLR on the number of birds allowed to be caught before fishing must cease.

Therefore, based upon ecological and socioeconomic information, **Alternative C1 is the preferred alternative** as it requires that all fishing, U.S. and non-U.S., harvest at or below the CCAMLR established catch limit which is precautionary to ensure effects on the icefish stocks in Subarea 48.3 are not adverse.

D. Icefish harvesting in Division 58.5.2.

Alternative D1: Issue permits annually in Division 58.5.2 by season and within the CCAMLR catch limits on vessels participating in the icefish trawl fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative D2: Consistent with CCAMLR Conservation Measures and future CCAMLR catch limits, issue permits annually in Division 58.5.2 by season limiting harvest to 4,690 mt (twice the largest amount of annual international harvest during the period from 1993-2003).

Alternative D3: Issue permits annually in Division 58.5.2 by season and by limiting harvest to 1,173 mt (half the largest amount of annual international harvest during the period from 1993-2003).

Alternative D4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

The range of potential harvest available to U.S. boats under the four alternatives in Division 58.5.2 is from 0 to 4,690 mt, although the latter would not be possible unless the catch limit was increased. This would be done only if new biological information determined from fishery independent survey(s) indicated that stock biomass had increased.

Assuming the catch limit remains unchanged, the highest possible U.S. catch would be only 292 mt. At present, harvesting at Alternatives 2 or 3 levels would not be permitted. The catch limit in Division 58.5.2 was reduced from 2,980 mt for the 2002/03 year to 292 mt for 2003/04 season as a result of new data being available from a research survey. This survey showed a reduction in recruitment to the icefish stock, and the precautionary catch limit was adjusted accordingly. Icefish populations usually consist of one or two strong year classes and as these decrease from age, the population size may decrease until the next strong year class is recruited. It is likely that the next new survey would provide indications of a new strong year class entering the fishery and the precautionary catch limit would be adjusted accordingly. If in the future the catch limits, which are determined using the precautionary GYM, were increased by CCAMLR even to the level specified in Alternative 2, harvesting at these levels would not adversely affect stock levels. This is because precautionary GYM catch limits are determined using decision rules that conform to three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

The United States has never fished for icefish in Division 58.5.2. Given the lack of U.S. participation in the fishery, Alternatives 1, 2, and 3 will not place a binding constraint on current U.S. fishing. In fact, under current conditions, there is no reason to believe that Alternative 4 will affect the industry. U.S. fishers are not fishing there now and they have never fished there. A prohibition on fishing will have no affect unless U.S. fishers want to participate in the Division 58.5.2 icefish fishery in the future. Should conditions change and the United States enters the fishery, they will be competing for catch. The current catch limit is greatly reduced from previous years, therefore, competition for catch would be intense. Nevertheless, anything U.S. fishers take will be part of the precautionary catch limit addressing future conditions and thus there will be no adverse effect on stock size.

There are no reported interactions with the icefish fishery and cetaceans. Additionally, no reports of cetaceans consuming icefish were found. Therefore, impacts of all alternatives for icefish in Division 58.5.2 on cetaceans are unknown though presumably minimal.

In 2003, 15 seabirds were recorded as bycatch in this fishery, including at least 6 fatalities. Species killed included white-chinned petrels, black-browed albatrosses, and cape petrels. Bycatch rate is expected to vary with catch limits, which are set yearly and fluctuate widely based on the variable year-classes of icefish. If catch limits were to increase beyond the 2002/2003 season limits, seabird bycatch would likely also increase. U.S. withdrawal from this fishery or implementation of domestic regulations more stringent than the CCAMLR catch limits are unlikely to affect seabird bycatch, because other countries will likely fish to the catch limit, and no successful mitigation measures are known that the United States could require of its vessels to decrease bycatch beyond what CCAMLR requires.

Therefore, based upon ecological, biological and economic information, **Alternative D1 is the preferred alternative** as it requires that all fishing, U.S. and non-U.S., harvest at or below the CCAMLR established catch limit which is precautionary to ensure effects on the icefish stocks in Division 58.5.2 are not adverse.

E. Krill harvesting in Area 48 (Including Subareas 48.1, 48.2, 48.3 and 48.4) and Divisions 58.4.1 and 58.4.2).

Alternative E1:	Issue permits annually in Area 48 and Divisions 58.4.1 and 58.4.2 by season and within the CCAMLR catch limits on vessels participating in the krill trawl fisheries (Status Quo; no-action alternative).
Alternative E2:	Issue five-year permits in Area 48 and Divisions 58.4.1 and 58.4.2 by season and within the CCAMLR catch limits on vessels participating in the krill trawl fisheries (Status Quo except for an extension to a five-year period). **(Preferred Alternative)**
Alternative E3:	Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Area 48 and Divisions 58.4.1 and 58.4.2 by season limiting harvest to twice the largest amount of international harvest during the preceding decade (i.e., 1993-2003).
Alternative E4:	Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Area 48 and Divisions 58.4.1 and 58.4.2 by season limiting harvest to half the largest amount of international harvest during the preceding decade (i.e., 1993-2003).
Alternative E5:	United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

CCAMLR has established total allowable catch (TAC) levels for krill in Convention Areas 48 (the Atlantic Ocean sector) and 58 (the Indian Ocean sector). CCAMLR has set a precautionary catch limit of 4 million mt for Area 48. The catch limit is based on a harvest rate of 9.1%, which results in a 4 million mt limit for the aggregate of Subareas 48.1 (1.008 million mt), 48.2 (1.104 million mt), 48.3 (1.056 million mt) and 48.4 (0.832 million mt). CCAMLR has agreed to apply precautionary catch limits to smaller management units than these subareas of Area 48, or on such other basis as the SC may advise, if the total catch in Area 48 in any fishing season exceeds 620,000 mt.

The total catch of all fishers participating in the krill fishery in Area 48 for the 2003/04 season was 117,899 mt. This was 2.9% of the available TAC for the area. Eight Members announced their intention to fish for krill in Area 48 during the 2004/05 season using 13 vessels with a projected catch of 226,000 mt. CCAMLR has set precautionary limits of 440,000 mt and 450,000 mt respectively in subdivisions 58.4.1 and 58.4.2. The catch limit in 58.4.1 is further divided into smaller units as follows: 277,000 mt west of 115˚ E and 163,000 mt east of 115˚ E. There has been no reported fishing for krill in Area 58 since 1995.

For environmental and logistical reasons, the krill fishery is likely to remain concentrated in the southwest Atlantic sector of the Southern Ocean as opposed to expanding into the Pacific or Indian Ocean sectors. Because of the favorable fishing conditions in the Southwest Atlantic sector, as well as proximity to supplies, shelter, ports and potential markets, this region may be viewed as the center of krill fishing operation. Despite the rather restricted potential for spatial expansion, the krill fishery in the South Shetlands may be far from reaching its capacity (Agnew and Nichol, 1996). Although the Scientific Committee has indicated that its ability to predict trends in the krill fishery is hampered by a lack of information on technological and economic developments, it has also noted that projections of future catches are likely to be higher than actual catches. With present total catch constituting less than 3% of the available TAC, there is very little likelihood that krill populations or krill dependent predators in the Convention Area ecosystem will be at risk due to increasing fishing pressures.

One krill vessel has participated in the krill fishery in Convention in Area 48 during four seasons, harvesting 70 mt in the 1999/2000 season; 1,561 mt in the 2000/01 season; 12,175 mt in the 2001/02 season; 10,150 mt in the 2002/03 season; and 8,900 mt during the 2003/04 season. The highest annual U.S. catch in any subarea in the past years is 7,062 mt in Subarea 48.2 (CCAMLR Statistical Bulletin Table 9.1). These amounts are miniscule compared to demands of marine mammal or other predator needs, which are substantially greater than catches taken by the U.S. The considerable biomass of krill, as estimated by the 2000 CCAMLR survey, relative to that which is taken by the krill fishery shows that.catches of these amounts will not likely impact krill stock levels in any region.

The range of potential harvest available to U.S. boats under the five alternatives in Area 48 and Divisions 58.4.1 and 58.4.2 range from 0 to 144,120 mt (twice historical high for Subarea 48.2 (Tables 3 and 24)). The economic effects of the Alternatives 1 through 4 on krill fishing in all regions are similar. For example, for Subarea 48.2 (highest historical harvest of 72,060 mt) and considering Alternative 3, the least strict of the four alternatives, the total fishery could increase eight times with the current catch limit (Table 24). Even with significant improvements in market conditions, Alternatives 1, 2, 3 or 4 should not have substantial effect on U.S. production of krill.

Alternative 2 is similar to Alternative 1 except that permits to harvest krill would be issued for a five-year period instead of annually. Whenever possible, and if a multi-year permit will not affect the resource, NMFS attempts to reduce the frequency with which fishers must apply for permits. This reduces the paperwork burden to the U.S. fisher and the administrative burden to NMFS. Given that total harvests in the krill fishery are less than 3% of the CCAMLR TAC and are expected, even with improved processing technologies, to remain at a very low relative percentage for the foreseeable future, five-year permits would not likely put krill populations or krill dependent predators in the Convention Area ecosystem at risk. A five-year permit for krill, like all AMLR permits issued by NMFS, would be subject to amendment to reflect any new restrictions or conditions adopted by CCAMLR or imposed by NMFS. CCAMLR, however, has made very few and very minor changes to its krill measures first adopted in 1991.

Alternative 4 will shut down the U.S. krill fishery and this would have a large impact on the one U.S. boat that operates in Area 48. It would also preclude further U.S. participation or expansion, but would have a very small effect on the United States who imports krill both for human consumption and for animal feed. U.S. imports in kilos for human consumption were zero in 2000, 17,703 in 2001, 73,748 in 2002, 27,523 in 2003 and zero in 2004. For animal feed the totals in kilos were 233,434 in 2000, 269,647 in 2001, 260,007 in 2002, 208,775 in 2003, and 326,137 in 2004. Also, Alternative 4 would have a very small effect on U.S. imports or consumption because the krill catch from the one U.S. boat is sold on the international market.

There have been no reports of cetacean interactions with the krill trawl fishery in any CCAMLR Area. Therefore the main potential indirect effect of the fishery on cetaceans is in their competition for food. Most balaenopterids in the Antarctic feed predominately on krill. Due to rough estimates of cetacean abundance in the Antarctic and even rougher estimates of consumption rates, it is difficult to fully evaluate potential effects of the krill fishery on cetaceans.

In 2000, CCAMLR and the IWC undertook a multinational, mult-ship survey of Area 48 to collect krill and cetacean data. As a result of this survey, a krill standing stock biomass was estimated for the area and abundances and krill consumption rates were estimated for various krill-eating cetacean species. Krill-eating cetaceans were analyzed and these included (estimated abundance): fin (4,524), humpback (9,366), minke (17,615), and right (1,670) whales (Reilly *et al*., 2004). The numbers of blue and sei whales seen were too low to obtain accurate abundance estimates. In comparing krill biomass estimates with consumption rates by all cetacean species combined, it was estimated that cetaceans in Area 48 consume approximately 5% (~2.5 million mt) of the krill standing stock (Reilly *et al*., 2004). In reviewing a paper that estimated consumption of krill by seabirds and pinnipeds in primarily the same area (Croxall *et al.*, 1995), it appears that cetaceans consume only about one-tenth as much krill as seabirds and pinnipeds. It is possible that there could be some area-specific competition; though based on available information on cetacean abundance estimates, consumption rates, and the krill standing stock (see Sections 3.1.b. and 3.4.a. - Cetaceans) it is unlikely that any of the alternatives for the krill fishery would have negative impacts on cetaceans.

There have been reports of pinniped interactions with the krill trawl fishery (this discussion is also found in See Sec. 3.1.c.). Revised data for 2002/2003 reported by the CCAMLR Scientific Committee in October 2004 indicate that a minimum of 114 Antarctic fur seals were caught in krill fishing operations in Area 48, 53 of which were killed and 61 released alive (SC-CAMLR-XXIII/4, paragraph 7.228). In the 2003/04 season, a total of 142 fur seals were observed killed and 12 seals released alive aboard the F/V Top Ocean, a U.S. flagged vessel. Overall a minimum of 292 fur seals were reported taken by the United Kingdom scientific observers deployed on six of the nine vessels fishing in Subarea 48.3 (the area including South Georgia and the South Sandwich Islands.)

The international observer was on board the F/V Top Ocean from February 21 to September 21, 2004. Trawling for krill was conducted in Subarea 48.3 from June 8 to 15 and from June 23 to August 2, 2004. The UK observer was present on that vessel in Subarea 48.3 from June 20 to July 20, 2004. Of the 142 observed Antarctic fur seal mortalities on the F/V Top Ocean, 138 were reported between June 23 and August 2, 2004.

The AMLR Harvesting Permit No. 22, issued by NMFS in March 2004, authorized F/V Top Ocean to harvest 30,000 mt of krill in CCAMLR Area 48 until November 30, 2004. Because F/V Top Ocean only harvested 8,100 mt of krill during this period, it applied for an extension of its AMLR permit. On November 30, 2004, NMFS amended Top Ocean's AMLR Harvesting Permit No. 22 authorizing harvest of the remaining 21,900 mt of krill until November 30, 2005, or until the authorized harvest limit was taken, whichever occurs first. Because of its earlier bycatch of fur seals, the extended permit required F/V Top Ocean to use a seal excluder device in addition to any other gear modification or fishing practice that reduces or eliminates Antarctic fur seal bycatch. The extended permit also required F/V Top Ocean to report on the efficacy of the seal excluder device and any other modifications to gear or fishery practices used to avoid seal bycatch. Top Ocean, Inc., has adapted a seal excluder device used by Japanese vessels for its F/V Top Ocean. Also, Top Ocean, Inc., was issued a HSFCA permit by NMFS on February 8, 2005, authorizing this fishing for krill in CCAMLR waters subject to the conditions and restrictions of amended AMLR Harvesting Permit No. 22. Both an AMLR permit and a HSFCA permit are required to fish in CCAMLR waters.

The take of Antarctic fur seals by the F/V Top Ocean in the 2003/04 fishing season was very small when compared to a population census taken in 1999/00 for South Georgia (the area of take) by the Scientific Committee on Antarctic Research (SCAR) Expert Group on Seals (a committee of the International Council for Science) which reported a population of Antarctic fur seals (*Arctocephalus gazella*) of 4,500,000 – 6,200,000 with a growing trend (www.scar.org , SCAR Expert Group on Seals subsite, Status of Stocks, Table 1). These numbers were estimated from the number of breeding females and are based on a standard deviation of 300,000. It is a substantial increase from the1990/91 census reporting a population of 2,700,000. Krill fishing took place during the entire period of this increase.

The twenty-eighth meeting of SCAR was held July 25-29, 2004. The Expert Group on Seals reported that both Antarctic fur seals and sub-Antarctic fur seals continue to increase over their entire range. Antarctic fur seals are not listed as either "threatened" or "endangered" under the U.S. Endangered Species Act.

There are no observer records of seabird bycatch in the CCAMLR krill fisheries. Current fishing effort and krill catch are not expected to affect seabird populations. At the current fishing effort, if the U.S. permits fishing away from seabird foraging areas and outside of the primary seabird breeding season, indirect impacts could likely be averted. (These foraging areas would vary depending on the species of interest and because there are no observer records, there is no simple way to accurately define which species are susceptible to bycatch in the krill trawl fishery, and therefore the foraging area cannot be specified.) If fishing effort approached the current CCAMLR catch limits, indirect impacts on seabirds could be expected owing to possible ecosystem changes from krill fishing (e.g., altering seabird access to food resources, indirectly reducing their fitness and possibly indirectly affecting their population).

The **preferrred alternative is Alternative E2** that ensures that all harvesting occurs at or less than the CCAMLR catch limit that is precautionary and will not result in adverse effects to stock levels. This alternative also allows permitting for five-year periods instead of annually.

EXPLORATORY FISHERIES:

F. Toothfish harvesting in Subareas 48.4, 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1.

Alternative F1: Issue permits annually in Subareas 48.4 and 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative F2: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Subareas 48.4 and 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1 by season and by limiting harvest to twice the largest amount of international harvest during the preceding decade (i.e., 1993-2003).

Alternative F3: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Subareas 48.4 and 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1 by season limiting harvest to half the largest amount of international harvest during the preceding decade (i.e., 1993-2003).

Alternative F4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

The United States has not fished for toothfish in these Subareas or Divisions. In fact, although several countries have notified CCAMLR of their intention to fish in one or more of these Subareas and Divisions, no substantial harvests have occurred to date. Catch limits are set based upon comparison of the amount of fishable bottom habitat in the exploratory region with those in established fisheries and then recruitment rates, etc. from the established fisheries areas are used in the exploratory regions. Fishable bottom habitat within the exploratory region is calculated by determining areas of seabed (using bathymetric databases of the Southern Ocean) where fishable concentrations of toothfish are likely to be encountered. To ensure that catch limits are precautionary, only a small proportion of the stock is then allowed to be harvested.

The exploratory toothfish fisheries have not been assessed and interactions between the fisheries and cetaceans are unknown. However, to date there have been very limited reports of interactions between fishing gear and cetations in exploratory fisheries. No instance of mortality associated with exploratory toothfish fisheries has been reported. Therefore, impacts of the toothfish fishery and the mentioned alternatives in the above Subareas and Divisions on cetaceans, as well as other marine mammals, are unknown, but likely insignificant.

There are no observer records of seabird bycatch for these exploratory fisheries. No effect on seabird bycatch rate would be expected for any of the alternatives, partly because the amount of fish caught is very low, and partly because other countries would harvest the entire CCAMLR limit if the United States were not fishing in these areas. The Amsterdam albatross is not known to occur in these areas, and so is not likely to be affected by fishing in Subareas 48.4, 48.6 and 58.4 (see Section 3).

The economic analysis of the alternatives is similar to that discussed below for Subarea 88.1 except there has been little or no fishing by any countries in these areas. Therefore, there is the potential to increase harvests up to the TAC levels if conditions permit. The **<u>preferrred alternative is Alternative F1</u>**, as it requires that all fishing, U.S. and non-U.S., harvest at or below the CCAMLR established catch limit which is precautionary to ensure effects on the toothfish in Subareas 48.4, 48.6 and Divisions 58.4.2, 58.4.3a, 58.4.3b and 58.4.1. are not adverse.

G. Toothfish harvesting in Subareas 88.1 and 88.2.

Alternative G1: Issue permits annually in Subareas 88.1 and 88.2 by season and within the CCAMLR catch limits on vessels participating in the toothfish longline fishery (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative G2: Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in Subareas 88.1 and 88.2 by season and by limiting harvest to

3,662 mt and 212 mt, respectively (twice the largest amounts of annual international harvest during the period from 1993-2003).

Alternative G3: Issue permits annually in Subareas 88.1 and 88.2 by season limiting harvest to 916 mt and 53 mt, respectively (half the largest amount of annual international harvest during the period 1993-2003).

Alternative G4: United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

Two U.S. vessels harvested 181 mt in Subarea 88.1 during the 2003/2004 season. The owner of the vessels had requested additional permits to fish in other areas but NMFS decided not to process these requests until the completion of the NEPA process for this PEIS. As a result, the owner could not continue fishing and decided to sell his vessels.

The range of potential harvest available to U.S. boats under the four alternatives is 0 for both Subareas to 3,662 mt for Subarea 88.1 or 212 mt for Subarea 88.2. However, the maximum for Subarea 88.1 would not be possible unless the catch limit was increased. Because sufficient data currently do not exist to conduct preliminary stock assessments (no surveys have been conducted to date), it would be unknown if future increases were precautionary or not.

Similar to the analysis of U.S. toothfish harvests in Subarea 48.3, the effects of Alternatives 1, 2, and 3 would be the same; none would place a binding constraint on U.S. harvest. Alternative 4 would prevent any U.S. fishing, but given little current industry interest in the toothfish fishery in Subareas 88.1 and 88.2, the effects on the U.S. industry would be minimal. If interest in the toothfish fishery increases, the impact would be more significant.

There is one slight difference between the effects of Alternative 4 in Subarea 48.3 and Subarea 88.1. Since the highest total world annual catch over the last ten years is lower than the TAC, if the United States is not allowed to fish here, it could result in a difference in the total harvest in the subarea. Because the TAC was not taken in it's entirely by vessels from other countries, the addition of U.S. vessels may result in an increase total harvest. What the United States did not harvest would likely not be taken by another country.

If there are significant changes in the market conditions for toothfish, it is possible that there could be an increased interest by U.S. boats in Subareas 88.1 and 88.2. Given the room to grow in this area, the United States could obtain a share of the uncaught TAC and so the amount made available to U.S. boats could make a difference in total removal. The difference between the TAC and the highest annual catch in the past ten years is 1,419 mt. This is the amount that could potentially be available. So if Alternative 3 where chosen the highest amount the United States could catch would be 916 mt. This is 28% of the TAC and 49% of the unharvested TAC. Increasing harvests to the TAC level would affect the stock size, but given the way the precautionary TACs are determined no adverse effect on stock levels would be expected. This is because precautionary GYM catch limits are determined using decision rules that conform to three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

Consequences of the alternatives suggested for the toothfish exploratory fishery in Subareas 88.1 and 88.2 on cetaceans are expected to be limited, since there have been limited reports of gear interaction with cetaceans by scientific observers. There have been reports of interactions with sperm whales removing fish from toothfish longlines in Subarea 88.1. Specifically, in the 2003/04 fishing season, there were 4 reported interactions with sperm whales and toothfish longlines (fish removed from longlines) in Subarea 88.1 and the reported catch in that Subarea was 2,166 mt. In these cases, further gear interaction was mitigated by moving the ship from the area where the citations were encountered. Based on those numbers, the prorated number of interactions with sperm whales in Subarea 88.1 under Alternative 2 would be approximately 6-8. Under Alternative 3, the expected number of interactions would be 2.

Killer whales were reported in 2004 to be present in this Subarea, but were not reported to have removed fish. This fishery has not been fully assessed, so the extent of interactions between the fishery and cetaceans is unknown. Interactions have been characterized by cetacean presence during hauls and removal of fish from longlines, thus it is expected that interactions would have a greater impact on the fishery than on the cetaceans. Interactions with Subarea 88.2 are unknown, since there are no observer reports to date describing whale intereactions in this Subarea.

In the six years that toothfish have been exploited in Subareas 88.1 and 88.2, there has been one bird caught (Southern Giant Petrel in 2004 fishing season in Subarea 88.1). Consequently, none of the alternatives are expected to significantly affect seabird bycatch in these areas.

Although catch limits are not based upon stock assessments, **Alternative G1 is the preferred alternative** because it ensures that the total amount of harvest, U.S. and non-U.S., will be at or below the CCAMLR established catch limit. This is believed to be precautionary as it uses all existing data and compares biological, fishable bottom types, and harvest rates to the assessed toothfish fishery in Subarea 48.3 to set present levels. Alternative G1 is preferred over other alternatives since it sets precautionary catch limits which provide sustainable harvest levels while conforming to decision rules that meet three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

H. Crabs and Squid harvesting in Subarea 48.3, grenadiers and rattails (*Macrourus*) harvesting in Divisions 58.4.3a&b, and spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*) harvesting in Division 58.4.2.

Alternative H1:	Issue permits annually in the above regions for the respective fisheries by season and within the CCAMLR catch limits (Status Quo; no-action alternative). **(Preferred Alternative)**
Alternative H2:	Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in the above regions for the respective fisheries by season and by limiting harvest to twice the largest amount of annual international harvest during the period 1993-2003.
Alternative H3:	Consistent with CCAMLR conservation measures and future CCAMLR catch limits, issue permits annually in the above regions for the respective fisheries by season and by limiting harvest to half the largest amount of annual international harvest during the period 1993-2003.
Alternative H4:	United States formally objects to CCAMLR catch limit as being too high and decides not to issue any annual permits.

The crab and squid fisheries in the CCAMLR Convention Area are currently inactive, so interactions with cetaceans are unavailable. Sperm whales are the predominant squid eating cetaceans in the Antarctic, followed by long-finned pilot whales and strapped tooth dolphins, and they could thus be negatively indirectly impacted if catch of squid increased substantially. Given that there is no current harvest of squid, and there is little probability that this will change in the foreseeable future, none of the alternatives are expected to affect cetaceans. If the fishery does develop in the future, CCAMLR currently has conservation measures in place that will ensure precautionary management of this resource.

These fisheries are inactive, so recent seabird bycatch data are not available. CCAMLR records indicate no seabirds were caught in an experimental squid fishery (Pers. Comm., Eric Appleyard, CCAMLR data officer, March 2005). If catches of squid increased dramatically, seabirds could be indirectly impacted by prey depletion, but this is not expected with current catch limits and the paucity of fishing in the region due to the lack of economic viability of the fishery. With current conditions, none of the alternatives are expected to affect seabirds.

There are no active fisheries for any of the above fisheries. Limited fishing has occurred for crabs and squid in Subarea 48.3 (see Table 1) but these have all proved to be economically unviable by all nations, including the United States, that have attempted to harvest these resources.

Crab

The highest annual harvest in Subarea 48.3 was 283 mt (Table 24) by the United States in 1995 while the catch limit has been fixed at 1,600 mt since the beginning of the fishery the same year. Therefore Alternative 2 would potentially limit harvest of crab to 566 mt rather that 1,600 mt. Although the 283 mt were taken by a U.S. boat, no U.S. boats have fished since the 1995/96 season. Unless processing or market conditions improve and a U.S. fisher initiates fishing in the future, the 566 mt limit (Alternative H2) will not be constraining.

Alternative 3 will lower the maximum allowable harvest of crab to 142 mt. This is less than the United States harvested in previous years so it could potentially be a future binding constraint on harvest. However, given the difficulties in processing the crab and the limited market for the product, even this lower limit for crab harvest should not constrain U.S. participation in the fishery in the foreseeable future.

Finally, unless things improve considerably, Alternative 4 will have no immediate effect either, although it would prevent future growth of crab harvest if conditions change. This could be problematic to U.S. fishers if they are not issued permits and a strong market develops for crabs.

Although none of the four alternatives would, at present, affect U.S. fishing efforts in CCAMLR waters, there could be interest from U.S. fishers in the future if the market for this product is developed. This is especially true because the reason the fishery has proven to be uneconomical was the inability to market the product (one species is small and the other has spines on the carapace which makes removing the meat difficult) despite catch rates of acceptable levels. It is unknown if technological or market forces in the future will mitigate the ecomonic issues surrounding this product. In the event of future use, **Alternative H1 is the preferred alternative** for crab because the current catch limit of 1,600 mt will be harvested by other countries and restricting the U.S. fishery will not restrict total harvest. This alternative is further preferred over the other alternatives since it sets precautionary catch limits which provide sustainable harvest levels while conforming to decision rules that meet three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

Squid

The United States has never had a directed fishery for squid in Subarea 48.3. Efforts by the UK and Korea to harvest squid in CCAMLR waters have failed because of low catch rates. If market and other conditions remain the same, there is no reason to believe that this will change in the foreseeable future. Therefore none of the alternatives will have any effect on the U.S. fishing industry nor on the status of the stock. If the fishery does develop in the future, CCAMLR currently has conservation measures in place that will ensure precautionary management of this resource. Note that the ten year high annual harvest is far less than the current TAC. Should conditions change and the United States enters the fishery there will be room for expansion that could result in higher overall catch.

Alternative H1 is the preferred alternative for squid. This alternative is preferred over the other alternatives since it sets precautionary catch limits which provide sustainable harvest levels while conforming to decision rules that meet three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

Other species

The United States has never had a directed fishery for *Macrourus* in Divisions 58.4.3a&b, and *Chaenodraco wilsoni, Lepidonotothen kempi, Trematomus eulepidotus and Pleuragramma antarcticum* in Division 58.4.2. Further there is currently no active fishery for these species by any CCAMLR member nation. If market and other conditions remain the same, there is no reason to believe that this will change in the foreseeable future. Therefore, none of the alternatives will have any effect on the U.S. fishing industry, the status of the stocks, seabirds, or any other marine organisms.

In summary **for all fisheries covered by the above four alternatives, Alternative H1 is the preferred alternative** as it requires fishing to be at or below the catch limit set by CCAMLR. As additional data become available, CCAMLR will modify catch limits to appropriate levels. This alternative is preferred over the other alternatives since it sets precautionary catch limits which provide sustainable harvest levels while conforming to decision rules that meet three CCAMLR objectives: to prevent decrease in size of harvested populations below that necessary for stable recruitment; to maintain ecological relationships between harvested, dependent and related species; and to prevent or minimize risk of changes not reversible over two or three decades.

FUTURE EXPLORATORY FISHERIES:

Alternative I1: Issue permits annually by season and within the CCAMLR catch limits after submission and review by the CCAMLR Scientific Committee of the Research and Fisheries Operations Plan required by CCAMLR Conservation Measure 21-02 (Status Quo; no action alternative) **(Preferred Alternative)**

Alternative I2: Issue permits annually by season and within the CCAMLR catch limits without requiring the submission of a Research and Fisheries Operations Plan as required by CCAMLR Conservation Measure 21-02

Conservation Measure 21-02 addresses exploratory fisheries, which are those fisheries lacking sufficient data to conduct a stock assessment (a more precise definition is contained in Section I. ACTION: <u>Impose harvest limits</u>). CM 21-02 directs the CCAMLR SC to develop a Data Collection Plan for each exploratory fishery that identifies data needs and describes actions necessary to obtain the relevant data from the exploratory fishery. Member countries that participate in the exploratory fishery must submit a Research and Fishing Operations Plan for review by the SC and the Commission. The CCAMLR Convention stipulates that the expansion of a new fishery must not proceed faster than the acquisition of information necessary to ensure that the fishery can and will be conducted in accordance with the principles of Article II of the Convention.

Catch limits in exploratory fisheries are set based upon a comparison of the amount of fishable bottom habitat in the exploratory region with those in established fisheries and then recruitment rates, etc. from the established fisheries areas are used in the exploratory regions. To ensure that catch limits are precautionary, CCAMLR allows only a small proportion of the stocks to be taken. Each vessel participating in the exploratory fishery must carry a scientific observer to ensure that data are collected in accordance with the agreed Data Collection Plan, and to assist in collecting biological and other relevant data.

Due to the precautionary manner in which catch limits are established for exploratory fisheries, and the data collection and reporting requirements of CM 21-02, no significant ecological impacts are expected under Alternative 1.

These future exploratory fisheries have not been assessed, therefore interactions between the fisheries and cetaceans, as well as seabirds, are unknown. While the impacts of Alternatives 1 and 2 on cetaceans and seabirds are unknown, Alternative 2 without requiring a research and fisheries operating plan could potentially have a negative impact on them.

Also, Alternative 2 would be a violation of the CCAMLR Conservation Measures 21-01 and 21-02 and its process for reviewing and authorizing new and exploratory fisheries. Therefore the **preferred alternative is Alternative I1.**

Bycatch of Finfish and Invertebrates.

There are a large number of species, families and orders of finfish and invertebrates listed by CCAMLR's Statistical Bulletin as having been caught either as bycatch to the fisheries listed above or by research cruises, during at least one season during the last decade (Table 1, CCAMLR 2000). Very small amounts are reported for most species (less than one-half of a mt) and most have been taken in only one or two seasons.

Finfish bycatch in the longline fishery for *Dissostichus* spp. is comprised primarily of rajids (skates & rays) and macrourids (rat-tails), with rajids generally caught in lower numbers. Although information is collected on bycatch levels and life history parameters for these species groups, no formal assessments have been conducted. Nevertheless, CCAMLR has established precautionary bycatch limits for five species in Subarea 48.3 (CM-33-01) and four species groups, plus a limit for all other species, in Division 58.5.2 (CM 33-02). No directed fishery for any species can be developed without regulation by a CCAMLR conservation measure and expected bycatch levels in the foreseeable future will remain within existing limits.

Because there is no directed fishing for these species, no alternatives are discussed to allow harvesting under any level except as specified as bycatch limits.

II. ACTION: Restrict longline fishing in CCAMLR Convention Area.

Alternative J1: Issue permits annually to U.S. fishery to conduct longline operations in accordance with CCAMLR conservation measures in effect for each specific region (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative J2: Prohibit all U.S. longline fishing in areas where levels of seabird bycatch interactions are high.

Alternative J3: Issue permits annually to U.S. fishery to conduct longline operations but limit number of seabird mortalities or marine mammal entanglements per vessel allowed in each CCAMLR area.

Alternative J4: Permit U.S. longline fishing in all areas without restriction.

The toothfish fishery is the only U.S. longline fishery in the CCAMLR region of the Antarctic. As previously stated, both sperm and killer whales consume toothfish and both may have interactions with the toothfish fishery. These interactions are primarily characterized by removing fish from the longlines. Alternative 2 would only impact cetaceans in areas where seabirds and cetaceans overlap with the fishery - and the impact would be to reduce the number of interactions with seabirds and cetaceans. Alternative 3 would result in fewer interactions with sperm and killer whales and the toothfish fishery. Depending on the definition of "high" for interactions, longlining would possibly be capped in Subarea 48.3; where sperm whales have been recorded present in 24% of the longline sets. Exploratory fishery interactions with cetaceans are currently unknown; however, in any event Alternative 4 is not a viable alternative because U.S. fishers must comply with CCAMLR requirements.

As far as economic effects are concerned, Alternative 1 would require U.S. fishers to conduct operations in accordance with all CCAMLR requirements, including season, bycatch, mitigation, observers, data reporting, and biological data collection. Since this alternative will not change current practice, it will have no socioeconomic impacts.

Alternative 2 would stop U.S. fishing in the areas in areas where seabird bycatch interactions are high. For the most part, this would affect entities focusing on toothfish. Where it applies, its effects would be identical to the alternatives under harvest controls that prevent harvesting all together. See Alternatives A4, B4, C4. D4, E4, F4, G4, and H4. It should be pointed out that any reduction in U.S. harvest in the long run will be matched by increases in harvest from other countries.

To the extent that the cap on seabird mortalities and marine mammal entanglement is binding on current or potential U.S. activities, Alternative 3 will cause a reduction in, or it will prevent a potential increase in, U.S. harvest.

To the extent that current regulations on the use of longlines restrict current or potential harvest, Alternative 4 could potentially lead to increases in future U.S. harvests of toothfish.

Alternative 4 is not a viable alternative; as a party to CCAMLR, U.S. fishers must at least comply with CCAMLR requirements (as in Alternative 1). If CCAMLR requirements were not enforced, seabird mortality would increase dramatically in some areas, and would likely threaten some seabird populations (see Section 3). Alternative 2 would decrease seabird mortality, if the United States were the only fishing country in the region, however, others would likely fish in these areas if the United States did not. Other countries would still be required to implement all CCAMLR Conservation measures related to seabird bycatch mitigation. Alternative 3 may give U.S. vessel operators an incentive to adhere to CCAMLR conservation measures and take all possible actions to prevent bycatch, since permits would only be issued to the U.S. fishers under the constraint of a fixed, limited, number of seabird or marine mammal entanglements; this could reduce bycatch in areas where high mortalities have the potential to adversely impact seabird populations. However, at this time, seabird mortality as bycatch in the regulated fishery is so low that no area of adverse impact has been identified; this could change as new and exploratory fisheries are initiated or if seabird populations of common bycatch species (i.e., black-browed albatross) continued to decline precipitously (See Section 3). At this time, **Alternative J1 is the preferred alternative**, since CCAMLR has implemented adequate conservation measure to mitigate bycatch.

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III. ACTION: **Restrict trawl fishing in CCAMLR Convention Area**.

Alternative K1: Issue permits annually to U.S. fishery to conduct trawl operations in accordance with CCAMLR conservation measures in effect for each specific region (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative K2: Prohibit all U.S. trawl fishing in areas where of seabird bycatch levels are high.

Alternative K3: Issue permits annually to U.S. fishery to conduct trawl operations but limit number of seabird mortalities or marine mammal entanglements per vessel allowed in each CCAMLR area.

Alternative K4: Prohibit all U.S. bottom trawl fishing in all areas.

Alternative K5: Permit U.S. trawl fishing in all areas without restriction.

No U.S. vessel has ever conducted finfish trawl fishing in CCAMLR waters, therefore, selection of either of the five alternatives would not affect the current U.S. finfish fishing industry. However, if in the future there is interest within the U.S. fishery to conduct trawl fisheries for finfish in CCAMLR waters, they will be affected by the various alternatives. Alternative 1 (status quo) provides for observers on all vessels, mandatory reporting of interactions with marine mammals and birds, use of mitigation measures to reduce seabird mortality, and data reporting requirements.

The United States is currently conducting krill pelagic trawling operations, however, fishing takes place in the upper pelagic zone of the water column, and hence the net does not interact with the ocean floor and no adverse effect on bottom flora or bottom fauna occurs. As discussed in Sec. 3.1.c. and 4.1 E - Krill, there have been seal interactions with the krill trawl fishery.

With respect to economic impacts, Alternative 1 would require U.S. fishers to conduct operations in accordance with all CCAMLR requirements, including season, by-catch, mitigation, observers, data reporting, and biological data collection. Since this alternative will not change current practice, it will have no socioeconomic impacts. More to the point, here and below, since there is no U.S. trawl fishery, there can be no economic effects given current and likely economic and biological conditions.

Alternative 2 would prohibit U.S. trawl fishing in CCAMLR regions where seabird mortalities were high. But since there currently are no U.S. trawlers in the area, there will be no effect on stocks or bird morality. It could prevent the initiation of a trawl fishery however. See discussion of Alternative J2.

To the extent that the cap on seabird mortalities and marine mammal entanglements is binding on potential U.S. activities, Alternative 3 will prevent the potential development of a trawl fishery.

Given current conditions this Alternative 4 will have no effect. However, should conditions improve, the potential initiation of a trawl fishery will be prevented. Because it applies to all areas regardless of potential seabird mortality, this will place a stronger constraint on possible future development of a U.S. trawl fishery.

The effects of Alternative 5 will be the same as for Alternative1 except that there could be fewer restrictions on a potential U.S. trawl fleet. It could not be implemented if it contravens the CCAMLR Convention.

There are little to no interactions reported between the trawl fisheries and cetaceans in the Antarctic. Therefore, little impacts would be expected by any of the trawl fisheries alternatives.

Alternative 5 is not a viable alternative; as a party to CCAMLR, U.S. fishers must at least comply with CCAMLR requirements (as in Alternative 1). If CCAMLR requirements were not enforced, seabird mortality would increase dramatically in some areas, and would likely threaten some seabird populations if fishing permits were issued. Alternatives 2 and 4 would decrease seabird mortality, if the United States were the only fishing country in the region, however since other countries fish in the same areas, others would likely fish in these areas if the United States did not. Alternative 3 may give U.S. vessel operators an incentive to adhere to CCAMLR conservation measures and take all possible actions to prevent bycatch; this could reduce bycatch in areas where high mortalities have the potential to adversely impact seabird populations. At this time, seabird mortality as bycatch is moderate in trawl fisheries, occasionally occurring in the icefish fishery. CCAMLR has recently put a cap on the number of seabirds that may be caught in the icefish trawl fishery. Bycatch could become problematic as new and exploratory fisheries are initiated or if seabird populations of common bycatch species (i.e., black-browed albatross) continued to decline precipitously. In addition, target species (krill and icefish) are food for some species of seabirds and overfishing could lead to indirect impacts of prey depletion, and bottom trawling could have indirect impacts on seabirds by impacting seabird prey species' habitat (see Section 3).

For both finfish and krill trawling, **the preferred alternative is Alternative K1** as it ensures that harvesting is done to mitigate seabird mortality and seal bycatch, observer coverage, and data collection and reporting is completed.

IV. ACTION: Scope of permits required to "harvest" and "import" toothfish.

Alternative L1:	Require a NMFS-issued AMLR harvesting permit to fish for toothfish inside the CCAMLR Convention Area; require a NMFS-issued AMLR harvesting permit to fish for toothfish outside the CCAMLR Convention Area; and require a DCD on all shipments of toothfish wherever harvested (Status Quo; no-action alternative).
Alternative L2:	Require a NMFS-issued AMLR harvesting permit to fish for toothfish inside the CCAMLR Convention Area and require a DCD for toothfish harvested inside the CCAMLR Convention Area.
Alternative L3:	Require a NMFS-issued AMLR harvesting permit to fish for toothfish inside the CCAMLR Convention Area and require a DCD on all shipments of toothfish wherever harvested. **(Preferred Alternative)**

Alternative 1 would continue to require AMLR harvesting permits to fish for toothfish outside the CCAMLR Convention Area. This would be inconsistent with the AMLRCA definition of AMLR. While there are some populations of toothfish found outside the CCAMLR Convention Area, they are not AMLR as defined by AMLRCA, and thus, legislatively, do not require an AMLR harvesting permit. Alternative 1 would, however, continue to require a DCD on all shipments of toothfish entering the United States, regardless of whether those toothfish were harvested inside the Convention Area (AMLR toothfish) or outside the Convention Area (high seas toothfish).

Alternative 2 would require AMLR harvesting permits only for toothfish harvested within the CCAMLR Convention Area and would, require DCDs only for toothfish harvested inside the Convention Area. This is inconsistent with the CCAMLR adopted Catch Documentation Scheme (CDS) measure which obligates each Contracting Party to the CCAMLR Convention, including the United States, to require that each shipment of toothfish, imported into or exported from its territory be accompanied by the export validated DCDs and, where appropriate, validated re-export documents that account for all toothfish contained in the shipment. The import, export or re-export of toothfish, wherever harvested, without a catch document is prohibited. Thus, by terms of CCAMLR Conservation Measures 10-05 the United States cannot exempt toothfish harvested outside the CCAMLR Convention Area from the requirement to be documented with a DCD.

Alternative 3 would amend NMFS regulations to return the definition of AMLR to the AMLRCA definition and, as a consequence, no longer require an AMLR harvesting permit to fish for toothfish outside the Convention Area. Alternative 3, however, would preserve the requirement that all imports of toothfish, wherever harvested and by whomever harvested, be accompanied by a DCD. It would also continue the requirement that all U.S. vessels harvesting toothfish apply, complete and transmit DCDs as required by NMFS regulations implementing the CDS. This requirement would apply to toothfish harvested from inside the Convention Area pursuant to an AMLR harvesting permit and to toothfish harvested on the high seas pursuant to a NMFS-issued High Seas Fishing Compliance Act (HSFCA)(16 USC 5501 et. seq.) permit.

Alternatives 2 and 3 would use the AMRLCA definition of AMLR as the basis for requiring AMLR harvesting permits for toothfish. Alternative 1 would substitute a definition of AMLR inconsistent with the AMLRCA definition and perpetuate the unintended consequence of the 2001 amendment to NMFS CDS regulations requiring a NMFS-issued AMLR harvesting permit for U.S. vessels to fish on the high seas outside the CCAMLR Convention Area. Alternatives 1 and 3 would assist in mitigating trade in IUU-caught toothfish as required by CCAMLR Conservation Measure 10-05. Alternative 2 would fail to implement U.S. obligations with respect to the CDS.

To the extent that Alternatives 1 and 3 mitigate trade in IUU-caught toothfish and thereby reduce IUU fishing for toothfish, there is a positive affect on marine mammals and seabirds that might otherwise be adversely affected by IUU fishing.

As the only alternative consistent with both AMLRCA and CCAMLR Conservation Measure 10-05, **Alternative 3 is the preferred alternative**. Alternative 3 would require AMLR harvesting permits of all U.S. fishers seeking to harvest toothfish within the CCAMLR Convention Area as a means of conserving and managing toothfish stocks and associated species within the Convention Area ecosystem. Alternative 3 would continue to require an HSFCA permit to fish for toothfish outside the Convention Convention Area. U.S. fishers applying for an HSFCA permit to fish for toothfish on the high seas outside the CCAMLR Convention Area may experience some delay in receiving an HSFCA permit pending assurances that issuance of such a permit is in compliance with NEPA, the ESA, and the Marine Mammal Protection Act (MMPA).

4.2 ISSUE TWO: Controls on Trade

I. ACTION: Import/re-export control program for AMLR.

Alternative 1: Existing Catch Documentation Scheme and Existing Pre-approval of DCD (Status Quo; no-action alternative).

While Alternative 1, the status quo, would continue to discourage IUU fishing for toothfish or overfishing of toothfish in general (e.g., by use of the current CDS and preapproval process), it would not be as effective as further restrictions utilizing tools (e.g., E-CDS and C-VMS) created by the CCAMLR explicitly for this purpose.

Alternative 1 would also maintain the fee requirement for dealers importing relatively small amounts of fresh fish per shipment. For the purposes of this DPEIS, "fresh toothfish" is defined as any fresh whole/eviscerated Patagonian toothfish (*D. eleginoides)* that is imported via air shippment and is correctly designated as 0302694097 in the Harmonized Tariff Schedule of the United States Annotated (HTS). This does not include fish that has been previously frozen. Dealers importing 2,000 kgs or more of fresh toothfish would pay the same fee of $200 as the dealer importing an average size container of 25,000 kgs of frozen toothfish under the current pre-approval system. This financially penalizes the dealer importing fresh product. This cost is further passed on to the consumers. In addition, the fresh product, most of which comes exclusively from Chile, is the part of the toothfish trade in which NMFS has the most confidence that the fish were caught legally, due to our bilateral working arrangement with Chile.

Alternative 2: No longer accept DCDs issued by CCAMLR member countries not fully participating in the E-CDS project once implemented by NMFS.

This alternative would greatly facilitate the trade of toothfish on behalf of the U.S. dealers. The dealers would no longer be required to obtain a DCD to be submitted with the required pre-approval documentation but would only be required to supply NMFS with the identifying information, which allows NMFS's CDS officer to access the documents online. The dealers would receive their approvals on a much faster timeline than that which results from the research of paper-based documents.

Because of this expeditious process, U.S. dealers have expressed their preference for buying fish with electronic documents. This gives them an added sense of security that the product they are buying has been legitimately harvested and legitimately documented following the protocol developed through CCAMLR. The other factor lending to their expressed preference is the expedited manner in which they receive approval for the shipment to enter commerce, avoiding expensive demiurge charges that accrue during the approval process, and making trade much smoother between participating countries.

The positive environmental impacts of this alternative are further control over the imports coming into the United States and a greater confidence that the product that is approved has been harvested legally and that the documentation has been completed truthfully and within the confines of the protocol agreed to by the Commission.

Alternative 3: No longer accept DCDs issued by any country not fully participating in the E-CDS project once implemented by the Commission.

This would have the same impacts as Alternative 2 but would cover a wider range of dealers since choosing this alternative would encompass all imports.

Alternative 4: No longer accept DCDs issued by CCAMLR member countries not participating in Centralized VMS (C-VMS), once implemented by the Commission.

This alternative would hugely benefit dealers. Over the past year, dealers who are importing product that had been harvested from high seas areas, specifically Areas 41 and 47, were required to wait for approval until such time that NMFS had received, translated, plotted and interpreted VMS tracts for fishing trips. This process was both labor intensive for the agency as well as caused delays, sometimes severe, to dealers waiting to import their product. This alternative would restrict dealers to importing product from vessels whose Flag States are fully participating in centralized VMS.

The only negative impact would be on those dealers who would be prohibited from buying product for import into the United States from vessels whose Flag State was not participating in the C-VMS. However, restricting imported product to only product covered by C-VMS may cause a price increase for fish harvested by compliant vessels, resulting in higher profits for dealers.

The positive environmental impacts of this alternative are further control over the imports coming into the United States and a greater confidence that the product that is approved has been harvested legally and that the documentation has been completed truthfully and within the confines of the protocol agreed to by the Commission.

Alternative 5: No longer accept DCDs issued by any country not participating in C-VMS, once implemented by the Commission.

This Alternative would have virtually the same impacts as Alternative 4 but would be even more restrictive thus amplifying the impacts.

Alternative 6: Will only accept DCDs that have been validated by officials of the port State government from where the toothfish was landed, exported, and/or re-exported where the port State government is a CDS participant.

This alternative would have an economic impact on the dealers who normally buy product from vessels whose Flag State continues to send their own officials to the port of landing to sign CDS documents. The Flag States currently still using this practice are Uruguay and Australia primarily. Given that fish imported from Uruguayan vessels was about 10% of the total amount of fish imported into the United States in 2003, this is significant. However, the benefit to dealers is the same as the benefits described in Alternative 4, that is, there would be less delay in processing approvals and therefore dealers would avoid lengthy time delays and port charges.

The positive environmental impacts of this alternative are further control over the imports coming into the United States and a greater confidence that the product that is approved has been harvested legally and that the documentation has been completed truthfully and within the confines of the protocol agreed to by the CCAMLR.

Alternative 7: Allow importers to submit 7501 Customs information after having submitted an application for pre-approval but within the 15 day overall pre-approval period.

This alternative would have no environmental impacts but would allow dealers to be within full compliance of our pre-approval requirements and remove the delay in submitting applications for pre-approval by allowing dealers to submit paperwork early, well within the 15 advance notice requirement.

Alternative 8: Prohibit importation of toothfish landed at a port other than a port of a CCAMLR Contracting Party.

This alternative probably offers the most control over trade in toothfish than any other. By restricting landings to only those ports under the control of a CCAMLR Contracting Party, who is bound to fully implement the CDS, NMFS is assured that Flag State official would enforce the CCAMLR CDS protocols for their vessels, as well as any other toothfish vessels, in their own ports. Requiring this would eliminate “ports of convenience” as well as eliminate the need for Flag State officials to fly their own inspectors to foreign ports to certify landings. The positive environmental impacts of this alternative are further control over the imports coming into the United States and a greater confidence that the product that is approved has been harvested legally and that the documentation has been completed truthfully and within the confines of the protocol agreed to by CCAMLR.

Alternative 9**:** No longer accept imports of toothfish harvested in FAO Statistical Areas once the CCAMLR Scientific Committee has confirmed that toothfish are not at significant population levels (i.e., where the SC has concluded that fishable populations do not exist) in those areas.

Currently, the process by which we approve imports that have been harvested from questionable areas, such as FAO Areas 41 and 47 is the requirement for VMS data to be submitted to the agency for review. If the VMS data are not verifiable and/or valid, or not in compliance with CM 10-04, the United States denies approval for the import. These restrictions along with the ban on imports from FAO Areas 51 and 57 (effective Oct. 2003) are the only measures that the United States has taken to restrict the import from high seas areas. If, and when, the Scientific Committee confirms that there are not significant population levels to support the reports of current harvested amounts, the United States could extend a ban to a prohibition to any area where the reports are not substantiated by science. This would have a significant beneficial environmental impact in that the only legal imports into the United States, essentially the worlds second largest importing nation, would be narrowed to fish harvested with CCAMLR areas and EEZ areas. This would reduce current levels of toothfish imports (based on 2003 data) by 36.5% of total volume.

Alternative 10: Implement Alternatives 3, 5, 7, 8, and 9. **(Preferred Alternative)**

While NMFS has no way of quantifying how many CCAMLR contracting party members and non-contracting party members will comply with both the E-CDS and the C-VMS, NMFS believes that, given that the United States is now the biggest global market for toothfish, the market will probably drive the compliance. Also, NMFS believes that choosing alternatives that restrict imports to those that have been harvested under C-VMS and are subsequently documented under E-CDS will have the greatest impact on decreasing IUU fishing. There may be socioeconomic impacts on U.S. dealers because they will be limited, at least initially, to those few vessels that are already in full compliance with both E-CDS and C-VMS.

Implementation of Alternatives 2-6 and 8 would significantly increase the protection afforded to seabirds in the Southern Ocean. All of these alternatives would reduce the possibility that IUU fish are imported into the United States. The current estimate of seabird mortality associated with IUU fishing is on the order of 40-60,000 per year, and has been described as unsustainable. The United States is the top importer of toothfish in the world, and should make every effort to ensure that all fish entering our borders are caught according to U.S. and CCAMLR regulations. The proposed alternatives would likely reduce the incentive for IUU fishing, as the United States would be able to prevent most importation of IUU fish. The implementation of Alternatives 2-6 and 8 represent the use of the best available resources to prevent importation of IUU fish; bycatch during IUU fishing is an important cause of mortality for many of the seabirds in the CCAMLR area, and has been identified frequently as the cause of population declines in many of these species (see Section 3.4 and Birdlife International 2000). Alternatives 3 and 5 provide some advantage over Alternatives 2 and 4 for prevention of seabird bycatch, as they are more stringent. The implementation of Alternatives 7 or 9 would not be likely to impact seabirds. Therefore, **the preferred alternative is a mix of Alternatives 3, 5, 7, 8 and 9**.

The consequences for cetaceans of the preferred alternatives are similar to those consequences for seabirds. Impacts of alternatives on cetaceans would be expected to be small, though preventing import of IUU fish would reduce the interactions of killer and sperm whales with the toothfish fishery.

II. ACTION: <u>Pre-approval for imports of fresh toothfish</u>.

Alternative 1: Shipments of fresh toothfish weighing less than 2,000 kg are exempt from pre-approval of DCD requirement (Status Quo; no-action alternative).

Note: 96% of the shipments are less than 2,000 kg.

This alternative would maintain an impossible situation for dealers to comply with the 15-day advance application process. Dealers who are importing fresh shipments of toothfish that weigh in at or over 2,000 kg will continue to be in non-compliance with the requirements to obtain a pre-approval, that is, specifically, they cannot obtain and submit to NMFS a copy of the completed DCD 15 days in advance as required by the current regulation.

Alternative 2: Also exempt shipments of fresh toothfish weighing more than 2,000 kg from pre-approval of DCD requirement. **(Preferred Alternative)**

The consequences of exempting shipments of fresh toothfish weighing more than 2,000 kg would be that the dealers would no longer be out of compliance with the requirements. The only negative consequence is that NMFS loses control of reviewing these shipments prior to their arrival and must review them within 24 hours after import along with the other fresh shipments. However, these larger shipments of fresh toothfish only comprise about 4% of the total amount of fresh shipments currently being imported.

The two alternatives for the pre-approval for imports of fresh toothfish are not expected to affect seabirds.

4.3 ISSUE THREE: Controls on Research

I. ACTION: <u>Revise the U.S. permit system for research within CCAMLR Ecosystem Monitoring Program (CEMP) sites</u>.

Alternative 1: Issue permits for U.S. researchers to conduct CEMP research at Seal Islands and Cape Shirreff (if Seal Islands is retained as a CEMP site by CCAMLR) based upon CCAMLR approved Management Plans set forth in Conservation Measures 91-03 and 91-01, respectively, that provides information on prohibited activities, access, movement, structures and waste disposal. (Status Quo; no-action alternative). **(Preferred Alternative)**

Alternative 2: Issue permits for U.S. researchers to conduct CEMP research at Seal Islands and Cape Shirreff (if Seal Islands is retained as a CEMP site by CCAMLR) with more severe restrictions than set forth by CCAMLR Conservation Measures 91-03 and 91-01, respectively.

Alternative 3: Issue permits for U.S. researchers to conduct CEMP research at Seal Islands and Cape Shirreff (if Seal Islands is retained as a CEMP site by CCAMLR) based upon lesser restrictions than set forth by CCAMLR Conservation Measures 91-03 and 91-01, respectively.

U.S. researchers have current permits to conduct research at Cape Shirreff. If permits were issued for Seal Islands or any other future sites designated by CCAMLR as CEMP sites, they would include all CCAMLR restrictions. Conditions of the permit include restrictions on activities to prevent damage, interference with, or adversely affecting CEMP monitoring and directed research; prohibition in occupation of the site during the period 1 June to 31 August; prohibition in entering pinniped or seabird colonies except for research purposes; restricted aircraft overflight, use of land vehicles, and pedestrian movement; construction of new structures by permit only; and prohibition of waste disposal and open burning.

Because many of the conditions for protection of CEMP sites are to prohibit activities, more severe restrictions required under Alternative 2 would not be possible. However, permitting more severe restrictions such as activities associated with research activities or prohibiting entry into research areas would adversely affect research activities and prohibit investigations needed to accomplish CCAMLR management.

Permitting activities currently restricted or prohibited as suggested by Alternative 3 would be in violation of CCAMLR conservation measures. However, this alternative does not contemplate issuing permits to conduct CEMP research at any level that would exceed the then current CCAMLR Conservation Measures; to do so would be unlawful.

The impacts of issuing a CEMP permit are ecological impacts. There are no economic or social impacts on the harvesting, importing or marketing sectors since the CEMP permit is issued to conduct research. The research undertaken pursuant to the permit affects seals, penguins and skuas, none of which are species harvested in the Convention Area. The AMLR Program takes pinniped species in CEMP sites as part of a long-term ecosystem monitoring program established in 1986. In addition to its CEMP permit, the AMLR Program holds a Marine Mammal Protection Act permit allowing a take of Antarctic fur seals (*Arctocephalus gazella*), Southern elephant seals (*Mirounga leonina*), Crabeater seals (*Lobodon carcinophagus*), Leopard seals (*Hydrurga leptonyx*), Ross seals (*Ommatophoca rossii*), and Weddell seals (*Leptonychotes weddellii*) by harassment associated with life history studies and census surveys for abundance and distribution of pinnipeds. The targeted species for census surveys is the Antarctic fur seal, however, due to overlap of their breeding range with southern elephant and ice seals, a relatively small number of other Antarctic pinnipeds could be taken incidentally during these surveys.

Studies are conducted annually during austral summers (i.e., Southern Hemisphere summers) and are primarily restricted to Cape Shirreff, Livingston Island, Antarctica. The AMLR Program also conducts a regional census survey for estimates of abundance and distribution of pinnipeds in the South Shetlands. Numerous other known or potential rookery sites, in addition to Cape Shirreff, will be surveyed during the regional census, including Telmo, Window, Desolation, Dee, King George, Nelson, Seal, and Elephant Islands, and other sites at Livingston Island.

The U.S.-AMLR Program's research activities under the MMPA Permit are divided into three Level A take (i.e., captures) and two Level B take (i.e., harassment only) categories: (1) Antarctic fur seal (*A. gazella*) females; (2) Antarctic fur seal pups; (3) Antarctic fur seal juveniles; (4) Antarctic fur seal census (Level B harassment only); and (5) all other pinnipeds (incidental Level B harassment only). For each category, the type of take is described in detail with proposed numbers, justification, and background. In addition, Accidental Lethal Take (6) and Import of Marine Mammal Parts (7) are described. Research activities each austral summer may begin as early as October and will continue as late as April. Due to the uncertainty of ship schedules to remote locations in Antarctica, precise dates are generally not available until approximately three months prior to the start of the field season. Except where noted, studies will be conducted at Cape Shirreff, Livingston Island (62^{o} 28' S, 60^{o} 46' W).

Cape Shirreff and the adjacent San Telmo Islets shelter the largest population of Antarctic fur seals in the South Shetlands Archipelago. Current estimates of the annual pup production are approximately 8,200 (Hucke-Gaete, unpublished data). The U.S.-AMLR Program's study beaches on the east-side of Cape Shirreff have an annual pup production of approximately 2,200 and have been increasing 5-6% a year over the last three years. The proposed take of 60 females per year represents 0.7% of the Cape Shirreff breeding population of females, and 2.7% for the focal study beaches. Re-captures of individual females are necessary to recover instruments and for intra-seasonal comparisons of foraging ecology.

The research and techniques undertaken generally include the use of VHF radio transmitters, diet studies involving enemas and milk collection, age determination by tooth extraction, blood collection, and tagging. All are currently being used and are permitted in other similar programs of research. The locations in which the research is conducted minimizes impact to other species of marine mammals. Weddell, leopard, and crabeater seals have an incidental occurrence and do not breed at Cape Shirreff. The southern elephant seal breeds at Cape Shirreff prior to arrival of researchers and their breeding sites are not near Antarctic fur seal breeding sites. The research program does not involve unique or unknown risks to Antarctic fur seals, other marine mammal species, or to the local environment. No aspect of this research would affect public health or human safety (except for the increased probability of a researcher getting bitten, however, all precautions are taken to minimize the probability of injury to humans or seals). We are unaware of any potential for any significant cumulative effect of the research program on marine mammal populations or the environment. There is also no likely loss or destruction of significant scientific, cultural or historic resources involved in the research program. None of the alternatives would be expected to directly impact cetaceans, and no adverse effects on endangered or threatened populations (or their habitat) is anticipated.

Alternatives 1 and 3 would not be likely to impact seabirds, as they both require following CCAMLR regulations. Alternative 2 could potentially prevent disturbance by researchers of breeding seabirds; some species of seabirds are sensitive to human disturbance and can have diminished reproductive success when disturbed. However, disturbance related to long-term behavioral alterations has not been observed at these CEMP sites.

Therefore, **<u>the preferred alternative is Alternative 1</u>** that puts into effect restrictions and prohibitions required by CCAMLR to ensure research sites are protected while allowing researchers the ability to collect data needed for management of harvested and dependent species.

II. ACTION: <u>Enhance collection of scientific data and research through the use of scientific observers, and develop regulations to support implementation of an observer program</u>.

Alternative 1: Require scientific observers on all U.S. vessels fishing in the CCAMLR Convention Area pursuant to CCAMLR's annual conservation and management measures requiring scientific observers and as a condition of a vessel's AMLR harvesting permit. (Status Quo; no-action alternative).

Alternative 2:	Amend NMFS regulations to clarify the requirement that all U.S. vessels fishing in the CCAMLR Convention Area, including vessels fishing for krill, or vessels conducting longline testing trials outside the Convention Area prior to longline fishing within the Convention Area, must carry one or more national scientific observer or scientific observer placed pursuant to a bilateral arrangement.
Alternative 3:	Amend NMFS regulations to include the terms of the CCAMLR Scheme of International Scientific Observation on bilateral arrangements for placement of observers.
Alternative 4:	Implement Alternatives 2 and 3. (**Preferred Alternative**)

Alternative 1 is the status quo alternative. It relies on conditioning AMLR harvesting permits to require that U.S. vessels fishing in the Convention Area carry one of more scientific observers consistent with annual conservation and management measures adopted by CCAMLR. Since CCAMLR does not require vessels fishing for krill to carry an observer, U.S. krill vessels are required to carry an observer only as a condition of their AMLR harvesting permit.

Alternative 2 would clarify, by codified regulation, that all U.S. vessels fishing in the Convention Area must carry one or more scientific observers as required by CCAMLR. There should be no additional cost or inconvenience to U.S. vessels since NMFS already requires, as condition of a vessel's AMLR harvesting permit, the placement of one or more observers and facilitates the placement of non-U.S. observers through the conclusion of bilateral arrangements. NMFS would continue to coordinate with vessel captains and observers on the duties of and responsibilities of both.

Alternative 3 would incorporate the CCAMLR standards for scientific observers placed pursuant to a bilateral arrangement into NMFS regulations and specify the standards for national observers in NMFS regulations. This alternative would clarify for vessel owners the role of scientific observers and the obligations of the vessel captain in carrying the observer (e.g., notification, placement, care and role of the observer).

Alternative 4 (implementation of both Alternatives 2 and 3) is the preferred alternative. Alternative 4 requires at least one scientific observer on all U.S. vessels fishing in the Convention Area, including vessels fishing for krill. It clarifies the role and responsibilities of vessel captains and observers, thus facilitating improved collection of data and records of observations. This would, additionally, ensure continued or improved observations of any interactions with cetaceans, pinnipeds, and/or seabirds and result in more specific recommendations for possible mitigation measures. Reducing the number of observers and the fisheries covered or failing to clarify observer duties and vessel captain responsibilities could reduce compliance with conservation measures for the mitigation of fishing on associated species. Moreover, it could compromise the ability of observers and CCAMLR to track interactions and mortalities of cetaceans, pinnipeds, and seabirds, with negative consequences for these species.

4.4 ISSUE FOUR: Enforcement Controls

I. ACTION: <u>Enhance enforcement capability through use of Vessel Monitoring System (VMS) with additional regulations to support implementation of the VMS</u>.

Alternative 1: Status Quo; no action alternative.

NMFS regulations presently require that the operator of any vessel holding an AMLR harvesting permit must "install a NMFS-approved VMS unit on board the vessel and operate the VMS unit whenever the vessel enters Convention waters" (50 CFR 300.107 (a) (4)). Although CCAMLR Conservation Measure 10-04 excepts the krill fishery from the mandated use of a VMS unit, NMFS regulations require VMS use in all CCAMLR fisheries, including the krill fishery. However, the NMFS regulations do not include a number of additional elements that experience in other fisheries has taught NMFS are important for the most effective implementation of a VMS. NMFS regulations also do not reflect the adoption by CCAMLR at its Fall 2004 meeting on centralized VMS (C-VMS). As adopted, a vessel's VMS unit must automatically communicate at least every four hours to a land-based fisheries monitoring center of its Flag State, and within time limits, to the CCAMLR Secretariat. The Secretariat will place the locational data on a password-protected website. The United States informed the Commission that, even though the four-hour reporting requirement applies only within the CCAMLR Convention Area, NMFS will continue to require port-to-port reporting every four hours for any toothfish shipments imported into the United States. For these reasons, the status quo regulation is unacceptable.

Alternative 2: Mandate use of VMS while the vessel is at sea and develop additional VMS regulations. **(Preferred Alternative)**

NMFS anticipates that the implementation of a more effective VMS regulatory program than the one currently in place will have no negative impacts on humans or the natural environment. NMFS's experience with VMS in fisheries throughout the nation has shown that it provides a cost/resource efficient method of monitoring vessels in remote areas, as well as accurate and reliable evidence in enforcement actions. VMS has also provided benefits to the fishing fleets through increased safety, better land-sea communications, and in providing exculpatory evidence for alleged violations.

Under both the current program and the Preferred Alternative, vessel owners will have to expend approximately $2,500 for the basic approved VMS transceiver unit and $250-$500 per year in communication costs. Costs to a vessel owner may increase if more sophisticated transceiver units are purchased for their specific operations. The preferred alternative may require vessels whose VMS fails at sea to return to a port for further investigation. Such an outcome is expected to be exceedingly rare due to the reliability of VMS transceiver units and NOAA's ability to work with vessel owners to address unit failures through other means.

Although it is difficult to quantify, NOAA anticipates that the preferred alternative will also reduce illegal, unregulated and unreported (IUU) fishing in the toothfish fishery. The CCAMLR Scientific Committee reported at its 2004 meeting that its studies show significant reductions in the amount of IUU fishing in the CCAMLR area in the past two years. The timing of this reduction corresponds with the implementation of VMS and catch documentation requirements. Though the Scientific Committee did not state that the reduction in IUU fishing was due to improved enforcement efforts like VMS and effective catch documentation, it did include it as one of the possible causes. A complete regulatory VMS package increases effective monitoring of vessels in very remote fishing areas like the CCAMLR area by ensuring that there are no loopholes in the regulations that might allow a vessel to operate at sea without a functioning VMS device, and by providing the vessel owners specific details for how to purchase, install, and operate the device. In addition, continued use of VMS allows NMFS to focus its limited resources on priority IUU matters thus increasing the likelihood for enforcement action to combat such practices. Lastly, a decrease in IUU fishing effort and trafficking of illegal toothfish product should have a direct beneficial effect on the toothfish resource, as well as bycatch from the fishery, by reducing the amount of fishing effort from IUU vessels.

Other positive impacts of an effective VMS regulatory program include increased safety for fishing vessels through use of the transceiver unit emergency device and improved communications between vessel operators, owners and NOAA through a cost efficient VMS-based email transmission system to remote fishing areas.

Also, implementation of Alternative 2 would provide enhanced protection from IUU for seabirds. Alternative 2 would ensure fishing is limited to permited areas and is not occurring in areas that have been closed to fishing to protect seabirds (e.g., areas of South Georgia (48.3) were closed during the breeding season to fishing, to protect the breeding seabirds)..

II. ACTION: <u>Enhance enforcement capability through participation in CCAMLR's Centralized VMS (C-VMS) program</u>.

Alternative 1: Non-participation in C-VMS (Status Quo ; no-action alternative).

NMFS is a strong advocate of C-VMS for CCAMLR and all other Regional Fishery Management Organizations (RFMOs), however, there are currently no U.S.-flagged vessels fishing for toothfish. As such, NMFS is not required to participate in a C-VMS and there is no need to immediately provide for the potential application. As explained in Alternative 2, non-participation in C-VMS would be anathema to NMFS's efforts at ending IUU fishing in the toothfish fishery. Alternative 1 is not preferred.

Alternative 2: Full Participation in C-VMS by U.S.-flagged vessels. (**Preferred Alternative)**

NMFS anticipates that the implementation of CCAMLR's C-VMS for U.S.-flagged vessels will have no negative impact on humans or the natural environment. Since the C-VMS requires NMFS only to redirect – through software reprogramming – VMS data that are already required for the national VMS to the CCAMLR C-VMS, there is no cost to the vessel owner or NMFS.

One U.S.-flagged krill vessel is required to use VMS now, and will be required to report through C-VMS.

Although it is difficult to quantify, NMFS anticipates that the preferred alternative will further reduce IUU fishing in the toothfish fishery. At the 2004 CCAMLR meeting, the CCAMLR Scientific Committee provided statistics showing a large decrease in the amount of observed IUU fishing effort in the Convention Area. The Scientific Committee recognized that the reduction could be due to increased enforcement vigilance, including the implementation of VMS two years ago, it stopped short of attributing the decline solely to enforcement efforts. Nonetheless, the success of VMS in numerous domestic and foreign fisheries shows that increased effectiveness in remote areas monitoring through VMS allows only non-participating vessels and skippers from participating nations who are willing to tamper with their on-board VMS device to transit monitored areas like the Convention Area undetected. C-VMS is the next generation of the currently required VMS, and because it allows NMFS to have one point of contact – the Commission - for all VMS data needs, it will allow enforcement resources to focus on specific threats rather than expending resources responding to every VMS data input from the many Flag States that have their toothfish product imported into the United States. C-VMS removes any filters or problems imposed into the vessel tracking by Flag States.

By reducing fishing effort, and therefore the opportunity for gear/bird interaction, implementation of Alternative 2 would provide enhanced protection for seabirds by preventing some IUU fishing. Alternative 2 would ensure fishing is limited to permited areas and is not occurring in areas that have been closed to fishing to protect seabirds. Also, other countries may continue to accept IUU fish (and consequently support bycatch of seabirds), however, the United States is a major importer and it is critical that the United States does not knowingly support IUU fishing through imports. C-VMS would assist in this process by allowing CCAMLR and NMFS to quickly and effectively monitor the location, and potentially, the operations of all reporting vessels, and therefore identify illegal shipments prior to, or at the time of, importation.

4.5 Identification of Additional Data Needs for Impact Analysis

There are no reasonably foreseeable significant adverse impacts arising from NMFS regulatory activities in CCAMLR; therefore, there is no need to identify any incomplete, unavailable, or additional data needs.

4.6 Impacts on Fish Habitat

None of the alternatives would impact fish habitat. Although longline gear can come in contact with the benthic substrate, the effects in terms of substantial habitat alteration for demersal finfish species or benthic invertebrate communities would likely be so negligible that it could not be measured. This is true as well for the crab pot fishery. In regards to trawl fishing for krill, this gear is fished in the upper pelagic zone of the water column, and does not come in contact with the benthic substrate. The only significant damage to seabed habitats would be as a result of commercial bottom trawling. However, there is no U.S. bottom trawl fishery in the CCAMLR Convention area, there never has been, and there will likely never be one in the future.

4.7 Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973, as amended, requires Federal agencies, in consultation with and with the assistance of the NMFS and the U.S. Fish and Wildlife Service (FWS) as appropriate, to insure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. As required, consultation has been requested to examine the effects of the proposed management regime on listed resources.

This document analyzes the potential impacts of the alternatives considered on ESA-listed species (see Sec. 3.4 "Potential Fishery Interactions with Protected Species

Species in the Convention Area (including those under the Endangered Species Act and Marine Mammal Protection Act)," as well as this Sec. 4 "Environmental Consequences of Alternatives Considered"). The conclusion from the discussion of alternatives is that the alternatives have insignificant degrees of impact, if any, on listed species. Where the impacts are unknown, they are believed likely to be insignificant.

There is no designated critical habitat in the action area, therefore, no critical habitat will be affected.

In carrying out its mandate under AMLRCA, NMFS fishery management actions that may affect seabird species that are listed as threatened or endangered under the ESA require NMFS to consult with the FWS under Section 7 of ESA. Thus, if a listed seabird may be captured or harmed in a fishery conducted under AMLRCA, NMFS (as the action agency that regulates the fishery) is required to consult with the FWS (as the consulting agency) to determine the most effective means of protecting seabirds during fishery operations. ESA requires NMFS to mitigate impacts of fisheries on endangered and threatened species such as the Amdsterdam albatross.

As a result of programmatic interagency Sec. 7 consultation on the issuance of fishing permits by NMFS under AMLRCA, in any or all of the fisheries managed by CCAMLR using longline, trawl, jig, or pot gear, FWS issued its biological opinion on March 2, 2004, that the issuance of these permits is not likely to jeopardize the continued existence of the endangered Amsterdam albatross, the only species listed under the ESA that is found in the Convention Area.

4.8 Marine Mammal Protection Act

Under the requirements of the Marine Mammal Protection Act (MMPA), each commercial fishery is categorized based on the level of incidental mortality and serious injury of marine mammals that occur in the fishery. The individual category determines whether participants in that fishery are subject to certain provisions of the MMPA such as registration, observer coverage, and take reduction plan requirements. All categories must report incidental mortalities and serious injury of marine mammals to NMFS. Fishing activities conducted by U.S. vessels in the CCAMLR Convention Area are not expected to have an adverse impact on marine mammal stocks.

4.9 Environmental Justice Concerns

With so few fishers and because there are no major adverse economic impacts resulting from implementation of the preferred alternatives, therefore, there would be no disproportionate impacts on low-income, Indian tribes, or minority populations.

4.10 Coastal Zone Management Act (CZMA) Concerns

The CZMA does not apply because no harvesting capacity would take place within the coastal waters of the United States and that importation of AMLR or AMLR product would be through U.S. customs ports of entry and will not impact the coastal zone of any state. Therefore, there was no need for a consistency determination.

4.11 Cumulative Impacts

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7). A cumulative impact includes the total effect on a natural resource, ecosystem, or human community due to past, present, and future activities or actions of Federal, non-Federal, public, and private entities. Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a Federal activity. This section describes the cumulative ecological (including biological), economic and social impacts of past, present and reasonably foreseeable future actions with regard to implementation of conservation and management measures adopted by CCAMLR.

Past, Present, and Reasonably Foreseeable Actions

NMFS published a framework Environmental Assessment (EA) in 1986 that proposed to implement the Convention on the Conservation of Antarctic Marine Living Resources (Convention) and the conservation and management measures adopted by CCAMLR. The Department of State publishes an annual Federal Register notice of conservation and other measures adopted by each annual meeting of CCAMLR and solicits comments during a 30-day comment period. These measures are binding on U.S. nationals under authority of the Antarctic Marine Living Resources Convention Act (16 USC 2431; see 50 CFR part 300 Subparts A and G).

Due to the scale of IUU fishing for Patagonian and Antarctic toothfish in the waters of the Convention Area, CCAMLR adopted a number of conservation measures in the mid to late 1990s. These measures included Flag State licensing of fishing vessels, catch quotas, vessel monitoring systems, port inspections of landings and transshipments, and identification of vessels and fishing gear.

In an attempt to discourage illegal harvest and control international trade in toothfish, CCAMLR, at its November 1999 annual meeting, adopted Conservation Measure 170/XVIII, Catch Documentation Scheme for *Dissostichus spp.* (CDS). NMFS implemented the CCAMLR CDS in regulations published at 65 FR 30016, May 10, 2000.

In 2003, NMFS promulgated regulations implementing several conservation measures adopted by CCAMLR. One of these modified the CDS regulations to implement a pre-approval procedure operated on a fee-for-service basis. The pre-approval process is intended to provide NMFS with sufficient time to review catch documentation papers in advance of import, thereby providing additional economic certainty to U.S. businesses associated with the *Dissostichus spp*. trade, as well as facilitating enforcement efforts. The trade control measures identified in Section 2 are intended to further refine and improve the CDS regulations.

Reasonably foreseeable future actions include development of final rules related to implementation of the above-identified preferred alternatives. In addition, it is expected that future rulemakings will consider additional bycatch reduction measures, modifications to season openings and closings, and species-specific quotas. Alternatively, for U.S. fishers, some of these restrictive measures may take the form of permit conditions, rather than regulatory actions.

Cumulative Ecological Impacts

Controls on Harvesting

As described earlier in this EIS, CCAMLR takes an ecosystem approach to management of Antarctic marine living resources and sets total allowable levels of catch in Convention Areas in a precautionary manner. The CCAMLR Scientific Committee considers cumulative harvest and harvest history when setting annual precautionary catch limits for CCAMLR fisheries. CCAMLR has also established bycatch limits for 5 species in Subarea 48.3 (CM 33-01) and 4 species groups, plus a limit for all other species in Division 58.5.2 (CM 33-02). Through these conservation measures, CCAMLR controls impacts on bycatch species resulting from the harvest of target species.

CCAMLR fisheries are open to all member nations and the TAC within each fishery is not allocated by country. Therefore, lack of participation by U.S. fishers, particularly in those fisheries where harvest levels reach the TAC, will not affect the amount of resources harvested because the catch not harvested by U.S. fishers will be caught by fishers from other nations. Conversely, issuing permits to U.S. fishers will not lead to an increase in the overall harvest level, particularly in the toothfish fishery, because the catch not harvested by U.S. fishers will be taken by fishers from other countries.

With the one exception of modifying the definitional language “toothfish wherever found” under the action considering scope of permits, the suite of preferred harvest control alternatives identified in this DPEIS are all status quo, no action alternatives. Because of CCAMLR’s precautionary approach to management of fisheries throughout the Convention Area, and given that NMFS issues permits conditioned and regulated in the same manner as is required by CCAMLR, no significant cumulative ecological impacts are expected from permitted fishing in CCAMLR-regulated fisheries.

Similarly, the modification of the current definition of Antarctic marine living resources to amend the language "toothfish wherever found" to "toothfish in the Convention Area" (Alternative L3), should not have any significant ecological impacts. It will clarify NMFS' authority under AMLRCA to issue harvesting permits within the Convention Area only.

The harvesting of toothfish outside the CCAMLR Convention Area will continue to require a High Seas Fishing Compliance Act (HSFCA) permit which will require consideration of the environmental impacts under NEPA and ESA related to issuing such permits. As a matter of law, the issuance of HSFCA permits is not accompanied by the host of conservation measures adopted by CCAMLR and implemented by U.S. regulations (e.g., restriction on longline setting during daylight hours and seabird mitigation measures) and, therefore, any toothfish fisher operating outside of the CCAMLR Convention Area would likely have greater flexibility in how he fished which could have ecological impacts different than those fishing in CCAMLR waters. NMFS is unaware of any U.S. interest in fishing toothfish outside CCAMLR waters.

IUU Fishing for *Dissostichus* species

IUU fishing for toothfish in the Convention Area has significant adverse ecological impacts, specifically unsustainable harvest levels of toothfish and unacceptably high seabird mortality levels. Although IUU fishing has declined over the past two years, it is still an ongoing problem for CCAMLR. Therefore, reasonable estimates of the biomass removed by IUU fishing are made on a yearly basis, and taken into account when assigning allowable catch levels. CCAMLR has also implemented the CDS to discourage IUU fishing on toothfish stocks. The CDS has enhanced efforts to prevent the unlawful harvest and trade of toothfish. These actions by the United States and other CCAMLR member nations are designed to combat IUU fishing and its ecological impacts. The decline in IUU fishing over the past two years appears to indicate that these actions are succeeding. Illegal fishing is not reported or suspected in any of the other Convention Area fisheries.

Controls on Trade

The EA prepared in 2003 in connection with the implementation of the pre-approval procedure for the CCAMLR CDS concluded that the cumulative impacts of the pre-approval procedure would build upon the environmental contributions of the original CDS program. That CDS program was designed to discourage the illegal harvest of toothfish by more effectively and efficiently denying the U.S. market to illegally harvested product. The trade control alternatives considered in this EIS, with the exception of the status quo alternatives and the pre-approval exemption alternative for imports of fresh toothfish, would provide additional restrictions on the importation of toothfish in order to further restrict trade in illegally harvested toothfish, and provide greater confidence that imports coming into the United States have been legally harvested and that the associated documentation has been completed truthfully and within the confines of the protocols agreed to by the Commission.

Therefore, the cumulative impacts of the trade control alternatives considered, particularly the E-CDS and C-VMS-related alternatives, are expected to be positive.

<u>Controls on Research</u>

As stated in Section 2.3, CCAMLR established a system of sites contributing data to the CCAMLR Ecosystem Monitoring Program (CEMP), and established protective measures to safeguard those sites from accidental or willful interference, e.g., prohibition on entering seabird colonies except for research purposes; restrictions on use of aircraft over research sites, use of land vehicles, construction activities, and waste disposal. Chile and the United States currently operate summer field camps located at the Cape Shirreff CEMP site and will likely continue to do so for the foreseeable future.

The preferred CEMP research control alternative is the status quo, no action alternative. The continued issuance of CEMP research permits with the restrictions and prohibitions required by CCAMLR is expected to have positive cumulative environmental impacts because research activities are carefully structured to contribute to knowledge of CCAMLR ecosystems while minimizing impacts to the environment as a result of research activities. NMFS does not anticipate any sharp increase in CEMP research activities in the foreseeable future.

The preferred research control alternative requiring observers on all U.S. fishing vessels and issuing regulations specifying minimum requirements for the notification, placement and care of observers is expected to have minor positive cumulative ecological impacts, attributable to increased data collection and observation of fishing operations. Observers on U.S. fishing vessels can provide information on other vessels in the fishing grounds, which aids in the enforcement of CCAMLR rules and may reduce IUU fishing. Trip reporting and observer data also provide useful information to NMFS regarding CCAMLR fisheries. Overall, the preferred alternatives for controls on research are expected to have a minor positive impact.

<u>Enforcement Controls</u>

NMFS anticipates that the promulgation of regulations to require full time operation of VMS (port-to-port coverage) and/or regulations to require the use of C-VMS will have beneficial ecological impacts. Enhanced VMS regulations and the use of C-VMS by U.S. fishers should ensure that U.S. fishing is limited to permitted areas and is not occurring in areas that have been closed to fishing to protect seabirds or to allow depleted toothfish stocks to recover. Full time operation of VMS and use of C-VMS by CCAMLR Members should have a positive ecological impact by virtue of stricter adherence to CCAMLR conservation measures by all CCAMLR Members; however, it is not possible to quantify potential IUU fishing and inadvertent interactions with cetaceans, pinnipeds, seabirds, and other non-target species.

At its twenty-third annual meeting in Hobart, Tasmania in 2004, CCAMLR Members agreed to implement the trial C-VMS that was conducted during the 2003/2004 fishing season. As adopted in 2004, a vessel's VMS must automatically communicate at least every 4 hours to a land-based fisheries monitoring center of its Flag State, and within prescribed time limits, to the CCAMLR Secretariat. Although this conservation measure only requires C-VMS reporting in the CCAMLR Convention Area, the United States will continue to require VMS coverage from port to port, with polling every four hours, for all toothfish shipments imported into the United States.

Cumulative Economic and Social Impacts

The cumulative economic and social impacts of actions taken since the 1986 framework EA on implementation of the Convention and the conservation and management measures adopted by CCAMLR have been minimal given the limited participation of U.S. fishers in CCAMLR fisheries. As discussed in Section 4.1 above, given the existing market and harvesting conditions, the cumulative economic and social impacts of the preferred harvest control alternatives will be minimal because they do not impose binding constraints on U.S. fishers operating in CCAMLR waters (i.e., the allowable harvests are, for the most part, much higher than even the highest historical catches).

In addition to reducing IUU fishing, the cumulative social and economic impact of all trade control actions in recent years has been positive because they have streamlined the process for importing fish harvested from CCAMLR waters and reduced delays in the system, thereby benefiting importers. Trade control measures adopted since 2000 have also increased importers' and consumers' confidence that the toothfish imported into the United States was legally harvested in accordance with all applicable CCAMLR regulations. The preferred trade control and enforcement alternatives identified in this EIS, particularly the E-CDS, the preapproval process for all imports of fresh toothfish, and the C-VMS alternatives, will further refine and improve existing trade control measures. They will also facilitate the trade of toothfish on behalf of U.S. dealers. The E-CDS, the expanded preapproval process, and the C-VMS will reduce the time required to process dealer requests for approval of toothfish imports. Under the E-CDS, dealers will have greater assurance that the toothfish they import have been legitimately harvested and documented according to CCAMLR protocols because the E-CDS scheme reduces the potential for fraudulent CDS documents.

Cumulative impacts of E-CDS and C-VMS will allow U.S. dealers to only import from those sources that are participating in both of these programs. NMFS has no way of projecting how quickly and to what end all those participating in this fishery will participate. There will be no direct cost to the importing industry and there should only be minimal cost for the fishers associated with participating in E-CDS and C-VMS since the Secretariat will be bearing those costs. Other impacts will be positive in that dealers will no longer need to communicate back and forth with exporting countries and exporting companies to obtain VMS data, wait for NMFS to review it, and then give them an approval. Impacts from participating in E-CDS have the same positive benefits because the dealers will not be responsible for obtaining the DCD documents any longer, the documents will be posted to the electronic system automatically. Through the E-CDS system the dealers will also not have to endure the lengthy review process because the system will only allow the generation of valid documents.

The alternative to exempt shipments of fresh toothfish weighing 2,000 kgs or more from current U.S. pre-approval requirements eliminates two problems: (1) the dealer would no longer be required to comply with an impossible 15-day advance submission of the DCD prior to obtaining an approval; and (2) the dealers importing fresh product would no longer be charged a $200 fee for each and every shipment of toothfish being imported. These impacts are expected to be positive.

None of the suite of preferred alternatives is designed to restrict or lessen the volume of harvest or trade of legally harvested Antarctic living marine resources. However, these measures are designed to reduce IUU product and ease the burden on importers of fresh toothfish weighing 2,000 kgs or more; therefore the extent of cumulative impacts is not quantifiable, but is believed to be small.

Cumulative Impacts of the Suite of Preferred Alternatives

Taken together, the suite of preferred alternatives identified in this EIS will have positive ecological, economic and social benefits. Historically, very few U.S. fishers have participated in CCAMLR fisheries and that is unlikely to change in the foreseeable future due to the harsh environment and remoteness of the CCAMLR Convention Area. Moreover, CCAMLR fisheries are managed in a precautionary manner. Therefore, issuing permits conditioned and regulated consistent with CCAMLR conservation and management measures will not have measurable significant ecological impacts. The preferred trade control and enforcement control alternatives are designed to discourage IUU fishing for toothfish. CCAMLR reported a significant drop in illegally harvested toothfish in the 2003/04 fishing season. Likely causes of the decrease include the successful implementation of the CCAMLR CDS. The implementation of E-CDS will improve and strengthen the CDS program. Further reductions in IUU fishing will have positive ecological impacts, primarily a reduction in unsustainable toothfish harvest levels and a reduction in seabird bycatch and mortality. The United States is a major importer of toothfish; therefore an effective program of trade controls and enforcement controls, primarily the E-CDS program and C-VMS requirements, will have significant positive ecological impacts due to a reduced demand for illegally harvested toothfish. Compliance with the CDS and C-VMS programs are expected to result in *de minimus* costs to the regulated industries (e.g., basic approved VMS units cost approximately $2,500, with annual communication costs of $250-$500 per year). The preferred research control alternative relating to observers will also provide ecological benefits because they will support data gathering that in turn will provide support for better resource management decisions.

Table 25 (Sec. 4.11): Table of Direct, Indirect, and Cumulative Impacts Arising from Preferred Alternatives.

	Positive Affects	**Negative Affects**	**No Measurable Affects**
I. CONTROLS ON HARVESTING			
ACTION I: Impose Harvest Limits			
A. Assessed Fisheries			
1. Toothfish harvesting in 48.3 -- Alternative A1			E 0 ES 0
2. Toothfish harvesting in 58.5.2 -- Alternative B1			E 0 ES 0
3. Icefish harvesting in 48.3 -- Alternative C1			E 0 ES 0
4. Icefish harvesting in 58.5.2 -- Alternative D1			E 0 ES 0
5. Krill harvesting in 48, 58.4.1, and 58.4.2 -- Alternative E2			E 0 ES 0
B. Exploratory Fisheries			
1. Toothfish harvesting in 48.4, 48.6, 58.4.2, 58.4.3a, 58.4.3b, 58.4.1 -- Alternative F1			E 0 ES 0
2. Toothfish harvesting in 88.1 and 88.2 -- Alternative G1			E 0 ES 0
3. Crabs and Squid harvesting in 48.3, grenadiers and rattails (*Macrourus*) harvesting in 58.4.3a&b, and spiny icefish (*Chaenodraco wilsoni*), striped-eye notothen (*Lepidonotothen kempi*), blunt scalyhead (*Trematomus eulepidotus*), and Antarctic silverfish (*Pleuragramma antarcticum*) harvesting in 58.4.2 -- Alternative H1			E 0 ES 0
C. Future Exploratory Fisheries			
Alternative I1			E 0 ES 0
ACTION II: Restrict Longline Fishing in CCAMLR -- Alternative J1			E 0 ES 0
ACTION III: Restrict Trawl Fishing in CCAMLR -- Alternative K1			E 0 ES 0
ACTION IV: Scope of Permits Required to "Harvest" and "Import" Toothfish -- Alternative L3			E 0 ES 0

Direct, Indirect, and Cumulative Impacts, Together, of Preferred Alternatives for Controls on Harvesting			E 0 ES 0
II. CONTROLS ON TRADE			
ACTION I: Revise Import/Re-export Control Program -- Alternative 10 (mix of Alts. 3, 5, 7, 8 and 9)	E + ES ++		
ACTION II: Revise Pre-approval System -- Alternative 2	ES ++		E 0
Direct, Indirect, and Cumulative Impacts, Together, of Preferred Alternatives for Controls on Trade	E + ES ++		
III. CONTROLS ON RESEARCH			
ACTION I: Revise CEMP Permit System -- Alternative 1			E 0 ES 0
ACTION II: Regulations to support implementation of an observer program -- Alternative 4 (mix of Alts. 2 and 3)	E +	ES --	
Direct, Indirect, and Cumulative Impacts, Together, of Preferred Alternatives for Controls on Research	E +	ES -	
IV. ENFORCEMENT CONTROLS			
ACTION I: Enhance Enforcement with VMS -- Alternative 2	E ++	ES -	
ACTION II: Enhance Enforcement with C-VMS -- Alternative 2	E ++ ES +		
Direct, Indirect, and Cumulative Impacts, Together, of Preferred Alternatives for Enforcement Controls	E ++ ES +		

Key:
E = Ecological (including biological) Affects

ES = Economic and Social Affects
Positive Affects: + minimal affects, ++ moderate affects, +++ large affects
Negative Affects: - minimal affects, -- moderate affects, --- large affects
No Measurable Affects: 0

4.12 Mitigation and Unavoidable Adverse Impacts (of the Preferred Alternatives)

The above analysis shows that the impacts of the preferred alternatives are very minor, if not negligible, from the economic and social aspects.

SECTION 5.0 MITIGATING MEASURES

NMFS is satisfied with the precautionary measures currently embodied in the harvest controls setting process and for this reason and because we have not identified any adverse impacts of the preferred alternatives, no mitigating measures are proposed. Through its issuance of AMLR harvesting permits, NMFS has imposed mitigating measures on toothfish longline F/Vs America No. 1 and American Warrior and on the krill trawler F/V Top Ocean. These measures were required by NMFS, and other mitigating measures could be required by NMFS in the future, in addition to those measures required by CCAMLR.

5.1 Unavoidable Adverse Impacts

There are not believed to be any additional costs to harvesters or importers if the preferred alternatives are adopted and implemented. Any incremental costs that industry may occur are believed to be a reasonable cost of doing business and necessary to effectively manage the fishery (e.g., vessel owners will have to expend approximately $2,500 for the basic approved VMS transceiver unit and $250-$500 per year in communication costs).
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IUU fishing does impose adverse impacts on the affected biological environment and as stated above the preferred alternatives for trade and enforcement controls would be helpful in lessening those impacts. The use of E-CDS will provide further control over imports of toothfish coming into the United States because the E-CDS is more secure and reliable than the paper-based system currently in use and provides greater assurance of compliance with CCAMLR's CDS procedures and protocols. Requiring the use of C-VMS with port-to-port reporting every four hours for all toothfish shipments imported into the United States will aid in lessening the impacts of IUU fishing by making it more difficult to import illegally harvested toothfish into the United States.

5.2 Irreversible and Irretrievable Commitment of Resources

Other than the administrative costs of this program, there are no irreversible or irretrievable commitments of resources.

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SECTION 7.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS CONSULTED AND TO WHOM COPIES OF THE EIS WILL BE SENT

Department of State, National Science Foundation, Environmental Protection Agency, U.S. Fish and Wildlife Service, Marine Mammal Commission, Center for Biological Diversity

SECTION 8.0 LITERATURE CITED/REFERENCES

8.1. **LITERATURE CITED/REFERENCES for Sections 2.1** (ALTERNATIVES - Harvesting Controls) **and 4.1** (ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES CONSIDERED - Controls on Harvesting):

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SECTION 9.0 ACRONYMS and ABBREVIATIONS

ACC -- Antarctic Circumpolar Current

ACZ -- Antarctic Convergence Zone

AMLR -- Antarctic Marine Living Resources

AMLRCA -- Antarctic Marine Living Resources Convention Act of 1984

ASPA -- Antarctic Specially Protected Areas

BNS -- Bonaerensis-northpatagonic stock (Argentine shortfin squid)

CCAMLR -- Commission for the Conservation of Antarctic Marine Living Resources

CCAMLR Scheme -- CCAMLR Scheme of International Scientific Observation

CCAS -- Convention on the Conservation of Antarctic Seals

CDS – Catch Documentation Scheme

CEMP -- CCAMLR Ecosystem Monitoring Program

CEP – CCAMLR Committee for Environmental Protection

CITES -- Convention to Control International Trade in Endangered Species of Wild Fauna and Flora

CM – CCAMLR Conservation Measure

Convention -- Convention on the Conservation of Antarctic Marine Living Resources

Convention Area – CCAMLR Convention Area

CPUE -- catch-per-unit-effort

CV -- coefficient of variability

C-VMS -- Centralized Vessel Monitoring System

DCD -- Dissostichus Catch Document

DPEIS -- Draft Programmatic Environmental Impact Statement

DOS – The Department of State

EA – Environmental Assessment

E-CDS -- Electronic Catch Documentation Scheme

EEZs – Exclusive Economic Zones

EFH – Essential Fish Habitat

ESA -- Endangered Species Act

FAO -- Food and Agricultural Organization

FPEIS -- Final Programmatic Environmental Impact Statement

FWS -- U.S. Fish and Wildlife Service

GYM -- Generalized Yield Model

HSFCA – High Seas Fishing Compliance Act

HTS -- Harmonized Tariff Schedule of the United States Annotated

IDCR -- International Decade of Cetacean Research

IUCN -- World Conservation Union or the International Union of the Conservation of Nature

IUU -- Illegal, Unregulated, and Unreported fishing

IW -- Integrated Weight

IWC -- International Whaling Commission

JAG - Joint Assessment Group

JSV -- Japanese Sighting Vessel

Kg – kilogram(s)

LES - land-earth station receiving and sending VMS data

MARPOL -- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978

MMPA -- Marine Mammal Protection Act

Mt – metric ton(s)

NEPA -- National Environmental Policy Act

NMFS -- National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

RFMOs -- Regional Fishery Management Organizations

SBS -- southern Brazil stock (Argentine shortfin squid)

SC -- Scientific Committee

SCAR -- Scientific Committee on Antarctic Research

SCIC -- CCAMLR Standing Committee on Inspection and Compliance

SPFZ -- South Polar Front Zone

SPS -- South Patagonic Stock (Argentine shortfin squid)

SSRUs -- Small Scale Research Units

SSS -- summer-spawning stock (Argentine shortfin squid)

SST -- sea surface temperature

TAC – Total Allowable Catch

VMS – Vessel Monitoring System

WG-FSA -- Working Group on Fish Stock Assessment

WG-IMAF --Working Group on Incidental Mortality Associated with Fishing

WG-IMALF --Working Group on Incidental Mortality Arising from Longline Fishing